A

UNIVERSITY
OF MICHIGAN

FEB 21 1956

MATH. ECON.
LIBRARY

JOURNAL *of* FARM ECONOMICS

PROCEEDINGS
NUMBER

THE AMERICAN FARM ECONOMIC ASSOCIATION
Volume XXXVII DECEMBER, 1955 Number 5

THE AMERICAN
FARM ECONOMIC ASSOCIATION

PAST PRESIDENTS

William J. Spillman 1910-12
George F. Warren 1913
David H. Otis 1914
Andrew Boss 1915
Harcourt A. Morgan 1916
Henry W. Jeffers 1917
George A. Billings 1918
John F. Fain 1919
Henry C. Taylor 1920
Walter F. Handschin 1921
Benjamin H. Hibbard 1922
Thomas P. Cooper 1923
Edwin G. Nourse 1924
Milburn L. Wilson 1925
Thomas N. Carver 1926
John I. Falconer 1927
Lewis C. Gray 1928
Henry E. Erdman 1929
Harold C. M. Case 1930
Oscar C. Stine 1931
John D. Black 1932
Howard R. Tolley 1933
William I. Myers 1934
Waldo E. Grimes 1935
Joseph S. Davis 1936
Oscar B. Jesness 1937
Ernest C. Young 1938
Irving G. Davis 1939
Foster F. Elliott 1939
Hugh B. Price 1940
Murray R. Benedict 1941
George S. Wehrwein 1942
Sherman E. Johnson 1943
Eric Englund 1944
Lawrence J. Norton 1945
Frederick V. Waugh 1946
Asher Hobson 1947
William G. Murray 1948
Oris V. Wells 1949
Warren C. Waite 1950
Forrest F. Hill 1951
George H. Aull 1952
Harry R. Wellman 1953
Thomas K. Cowden 1954
Joseph Ackerman 1955

Price: $5 per year, this issue $1.25

Entered as second class matter at the post office at Menasha, Wis. Acceptance for mailing at a special rate of postage provided for in the Act of February 28, 1925, paragraph 4, section 412, P. L. & R., authorized November 27, 1931. Printed in U.S.A.

THE JOURNAL OF FARM ECONOMICS is published five times a year during February, May, August, November and December by The American Farm Economic Association. Yearly subscription $5. Published at Menasha, Wisconsin.

JOURNAL OF FARM ECONOMICS

December 1955

CONTENTS

The Orientation of Agricultural Economics ..... *Karl Brandt* 793
Economic Growth and Development
Conditions and Rates of Economic Growth ..... *Howard S. Ellis* 807
Contributions of Agricultural Policies to General Economic Growth ..... *Frederick V. Waugh and James P. Cavin* 821
Discussion ..... *William H. Nicholls* 834
Discussion ..... *O. B. Jesness* 837
Economic Implications of Farm and Home Planning Work
The Role of an Agricultural Economist in a Farm and Home Development Program—from an Administrator's Viewpoint ..... *E. J. Nesius* 841
Organizing Economic Research Specifically for Use in a Farm and Home Development Program ..... *Sydney D. Staniforth and Lee M. Day* 849
Discussion ..... *Stuart Brabant* 857
Discussion ..... *C. B. Ratchford* 859
Discussion ..... *P. E. Johnston* 863
The Economics of the Control and Use of Water
The Development and Present Status of Water Rights and Water Policy in the United States ..... *Wells A. Hutchins* 866
Some Economic Issues in Water Rights ..... *S. V. Ciriacy-Wantrup* 875
Organization and Administrative Arrangements for an Effective Water Policy ..... *Harry A. Steele and Mark M. Regan* 886
Discussion ..... *Raleigh Barlowe* 897
Discussion ..... *Elco L. Greenshields* 899
Discussion ..... *Wilfred H. Pine* 901
Welfare Implications in Marketing Research and Extension
Welfare Implications of Market Prices ..... *T. A. Hieronymus* 904
Welfare Implications of Efficiency and Technological Improvements in Marketing Research and Extension ..... *Lawrence Witt* 912
Discussion ..... *Donald L. Brooke* 923
Discussion ..... *Allen B. Paul* 926
Agricultural Financing
Reorientation of Policies in Agricultural Financing ..... *R. C. Engberg* 928
Measuring Risk in Farm Mortgage Lending ..... *George K. Brinegar* 941
Influence of Trade Credit on Broiler Production ..... *John O. Gerald* 950
Discussion ..... *Ernest T. Baughman* 959
Discussion ..... *Reynold P. Dahl* 963
Discussion ..... *J. H. Blackstone* 965
Demand Analysis
How Much Progress Has Been Made in the Study of the Demand for Farm Products? ..... *E. J. Working* 968
A Comparison of Single and Simultaneous Equation Techniques ..... *Richard J. Foote* 975
Discussion ..... *Walter D. Fisher* 990
Discussion ..... *George G. Judge* 992
Dairy Production and Marketing Problems
The Impact of Technological Changes on Milk Production .. *R. G. Wheeler* 996
The Dairy Problem and a Suggested Solution ..... *Herbert C. Kriesel* 1005
Economic Problems Associated with Milk Marketing Orders ..... *E. W. Gaumnitz* 1016
Discussion ..... *M. S. Parsons* 1021

Discussion ..... *E. Fred Koller* 1023
Discussion ..... *Leland Spencer* 1025
Providing More Adequate Agricultural Data
Making Existing Local Data More Available and Useful ... *Frank V. Beck* 1030
New Data Requirements by Areas: How Can They Be Met? *George T. Blanch* 1038
Local Data Wanted by Business Firms ..... *Dorris D. Brown* 1047
Needed Changes in State and Local Crop and Livestock Reports ..... *Francis A. Kutish* 1050
Discussion ..... *R. K. Smith* 1053
Discussion ..... *C. J. Borum* 1056
Discussion ..... *Marvin A. Schaars* 1057
Discussion ..... *Samuel J. Gilbert* 1058
Adjustment Problems in a Growing Economy
Adjustments in Production to a Growing Economy ..... *Earl O. Heady* 1060
Adjustments in a Growing Economy—Social Considerations ..... *Robert L. Clodius* 1070
Low-Income Problems in a High-Employment Economy ..... *Karl A. Fox* 1083
Discussion ..... *H. B. James* 1090
Discussion ..... *G. A. Peterson* 1091
Discussion ..... *Franklin J. Reiss* 1093
Progress and Problems in Decision Making Studies
The Nature of the Study ..... *Harald R. Jensen* 1097
The Universe of Farms Studied ..... *Cecil B. Haver* 1102
Some Problems of Method in the Interstate Managerial Survey .. *Joel Smith* 1105
The Friedman-Savage Utility Hypothesis in the Interstate Managerial Study ..... *Glenn L. Johnson* 1110
Sociological Aspects of the Decision Making Process ..... *D. Woods Thomas* 1115
Possible Implications of Decision Making Studies for Farm Management Teaching and Research ..... *Lowell S. Hardin* 1119
Possible Implications of the North Central Interstate Managerial Study for Farm and Home Development Programs ..... *Earl O. Heady* 1122
Economic-Legal Approach to Agricultural Problems
Integration of Law and Economics in Analyzing Agricultural Land Use Problems ..... *John F. Timmons* 1126
Making Land Laws Serve Economic Ends ..... *J. H. Beuscher* 1143
Discussion ..... *Don Kanel* 1153
Discussion ..... *John C. O'Byrne* 1157
Supply Analysis
Conceptualizing the Supply Relation in Agriculture .. *Willard W. Cochrane* 1161
The Wheat Supply Function ..... *B. J. Bowlen* 1177
The Supply Elasticity for Milk in the Short Run ..... *Harlow W. Halvorson* 1186
Discussion ..... *Louis H. Bean* 1197
Discussion ..... *G. L. Jordan* 1199
Industry Cooperation in Marketing Research
Assistance Available from Industry ..... *R. D. Hardesty* 1202
Industry Cooperation in Frozen Food Distribution Research ..... *H. Wayne Bitting* 1204
Industry Cooperation in Studies of Fruit and Vegetable Packing House Efficiency ..... *B. C. French* 1209
Industry Cooperation in Marketing Facilities Studies .... *William C. Crow* 1215
Industry Cooperation in Marketing Research—Potential Opportunities ..... *Howard L. Stier* 1219
Activity Analysis
Linear Programming as a Tool in Farm Management Analysis ..... *Chester O. McCorkle, Jr.* 1222
Activity Analysis: An Agricultural Marketing Tool ..... *Charles E. French* 1236
Integrating Crop and Livestock Activities in Farm Management Activity Analysis ..... *Earl R. Swanson* 1249

Discussion ..... *James S. Plaxico* 1258
Discussion ..... *Kirk Fox* 1261
Discussion ..... *R. J. Hildreth* 1263
Political Economy Reconsidered
Applying Welfare Economics to Farm Policy ..... *O. H. Brownlee* 1266
Policy Formulation and Economic Literacy ..... *Earl L. Butz* 1271
Evaluation of Extension Methods Employed in Farm and Home Development
Evaluation of Extension Methods Used in Farm and Home Development in the Midwest ..... *N. S. Hadley* 1278
Evaluation of Extension Methods Employed in Farm and Home Development in the Northeast ..... *P. L. Putnam* 1286
Evaluation of Extension Methods Employed in Farm and Home Development in the South ..... *M. S. Williams* 1293
Evaluation of Extension Methods Employed in Farm and Home Development in the West ..... *Arthur W. Peterson* 1298
Evaluating Extension Methods Used in Farm and Home Development: Reappraisal ..... *James Nielson* 1302
Integration of Research and Extension in Agricultural Policy
Increasing Farmers' Understanding of Public Problems and Policies ..... *J. Carroll Bottum* 1307
Methodological Problems in Agricultural Policy Research .. *G. E. Brandow* 1316
Discussion ..... *Raymond J. Penn and Peter Dorner* 1324
Discussion ..... *Robert W. Rudd* 1327
Discussion ..... *Geoffrey Shepherd* 1329
Relative Efficiencies of Alternative Tenure Systems
A Framework for Orienting Research in Land Tenure Within the Efficiency Concept ..... *Walter E. Chryst* 1333
The Application of Efficiency to Farm Tenure Arrangements ..... *Howard W. Ottoson* 1341
Two Empirical Techniques Applicable to Land Tenure Research: Linear Programming and Single Equation Models ..... *W. D. Toussaint* 1354
Discussion ..... *Virgil L. Hurlburt* 1363
Discussion ..... *W. E. Hendrix* 1367
Objectives of Marketing Education Programs
The Place of Consumer Education in Increasing the Demand for Food ..... *Robert C. Kramer* 1370
The Place of Merchandising and Promotion in Expanding the Demand for Food ..... *R. L. Kohls* 1380
Predicting Market Acceptance ..... *Trienah Meyers* 1387
Discussion ..... *Karl Shoemaker* 1394
Discussion ..... *Robert M. Walsh* 1395
The Low-Income Farm Problem
Trends and Characteristics of Farm Population in Low-Income Farming Areas ..... *Louis J. Ducoff* 1399
Economics of the Low-Income Farm Problem ..... *Kenneth L. Bachman* 1408
Sociological Aspects of the Low-Income Farm Problem ..... *Olaf F. Larson* 1417
Part-Time Farming and the Low-Income Farm Problem .. *Charles E. Bishop* 1428
Discussion ..... *H. R. Moore* 1435
Discussion ..... *Charles P. Loomis* 1438
The Economics of Forage Production and Utilization
Problems of Research in the Economics of Forage Production and Utilization ..... *Russell O. Olson* 1440
Economic Application of Forage Production and Utilization Research ..... *Irving F. Fellows* 1448
Economics of Forage Evaluation .. *Lowell S. Hardin and Glenn L. Johnson* 1457
Discussion ..... *S. A. Engene* 1460
Discussion ..... *B. D. Crossmon* 1461
Discussion ..... *Carl P. Heisig* 1463

What Is the Food Industry Doing to Stimulate the Demand for Food?
Economic Aspects of Food Advertising and Promotion ....*Herrell DeGraff* 1465
The Economic Need for Advertising Programs to Stimulate the Demand for Foods .....*Guy-Robert Detlefsen* 1474
Discussion .....*E. S. Clifton* 1484
Discussion .....*Walter B. Garver* 1487
Minutes of the Meeting of the Executive Committee of the American Farm Economic Association, Michigan State University, July 31, 1955 1489
Minutes of the Annual Business Meeting, August 3, 1955 1491
Report of the President 1492
Report of the Secretary-Treasurer 1493
Report of the Editor 1497
Report of the Agricultural Data Committee 1497
Report of the Activities of the Student Section of the American Farm Economic Association 1499
Results of Student Debate Contest, 1955 1500
Results of Student Public Speaking Contest, 1955 1500
Report on the Activities of the Special Finance Committee of the Awards Program 1500
List of Contributors and Amounts Donated to the AFEA Awards Program During 1954 and 1955 1501
Report of the Awards Committee of the American Farm Economic Association, 1955 1501
Report of the Election Tellers 1503
Minutes of the Executive Committee Meeting, August 3, 1955 1504
Minutes of the Meeting of the Executive Committee, December 30, 1955 1506
Index to Volume XXXVII 1509

JOURNAL
OF
FARM ECONOMICS

Volume XXXVII DECEMBER, 1955 Number 5

THE ORIENTATION OF AGRICULTURAL ECONOMICS*

KARL BRANDT
Stanford University

I

WHEN I chose this subject I had no ambition to shoulder the burden of a critical survey of argicultural economics today—45 years after the founding of our Association. Others have found that such an undertaking requires an extensive committee, large funds, and years of work. Nor was I prompted by misgivings about our profession's performance in the pursuit of truth or the services it renders. Repeatedly, in recent years, I have seen the work done by American and Canadian agricultural economists from observation points in other parts of the world. I am the more profoundly impressed by what has been achieved within one generation, how much is going on, and how much better public service may confidently be expected in coming years.

My purpose is to offer a modest amendment to the discussion that O. V. Wells began at the 1953 Annual Meeting in Corvallis, and to which almost the entire meeting in 1954 at Pennsylvania State University was devoted, when a roster of highly accomplished members went over almost every phase of agricultural economic activities (research, teaching, and extension work) and most of the fields of special problems. My amendment contains no new formula, no program for action in research, teaching, or extension, nor does it point out unexplored terrain for prospectors in search of new ores of wisdom. I wish merely to raise some questions about the orientation of the main body of economic thought and the further action of our profession.

Some of these questions arise from a desire to grasp the present size and composition of our accrued inventory of knowledge, and to understand the forces and processes that operate in the direction of its expan-

* The author is indebted to Peter T. Bauer of Cambridge University, and to his colleagues Merrill K. Bennett and William O. Jones of the Food Research Institute, for helpful criticisms and suggestions.

sion. By what and how is our specific science actually being oriented? Does it receive its impetus only from the creative imagination of leading members of our profession? Does it grow by swarming over the terrain, and the gradual, piecemeal discovery of facts in detail? If so, do the details concerning the production and exchange of food, feed, and fiber in themselves form parts of a coherent system or a natural order, so that we inevitably discover the forest by dealing with trees and groves of trees? Does its growth and maturation occur as the haphazard accumulation of pieces of work by the random private initiative of individuals in our profession according to their hunches or preferences? Or is there a sort of invisible yet effective collective strategy of groups within the profession that opens new vistas and builds a more comprehensive architecture of understanding?

Any one of these questions arouses serious embarrassment, because we sense the crude oversimplification they seem to assume in dealing with a complex pattern of growth that perhaps combines elements of all such procedures and their motivations. Yet it appears highly probable that despite the infinite variety of influences combining to make a science grow, some major ones are predominantly active. Taking all the evidence into account, I think that like other social-science disciplines agricultural economics has taken its cue for choosing its subjects, as well as abandoning them, from the political, social, and economic problems that beset society and the need for assistance in solving them. Areas of research have also been determined chiefly by the changing scenery of economic trouble and social conflict. In none of the other social sciences does this seem to have been more true than in agricultural economics in the United States.

This demand expanded from expected aid in production by what was staked out as farm management, or what we might call the economics of the farm enterprise or the firm in agriculture, to marketing; from there to prices, demand and supply, to farm credit, indebtedness, land tenure, and economic cycles. Installed primarily in colleges of agriculture and mechanic arts or at the centers of government, agricultural economists responded to this challenge by tackling the subject matter as the demand for the practical application of more knowledge became urgent and pressing. The movement, step by step, from microeconomics to macroeconomics—from the farm to the market and to national and international problems—may appear logical, but one has only to look at the background of what happened on the farm and in the market to see that the course of economic history surpassed disciplinary logic in influencing the progress of agricultural economics in the United States and the widening scope of its investigations. The early formative stage came in the final

phase of the expanding world economy before World War I, with the gold standard in operation, and virtually no autarchy policies anywhere. World War I, inflation, postwar price deflation, reconstruction in the 1920's, the crash and worldwide depression, the reform and recovery period, World War II, the enormous economic expansion, and problems of resource development have only to be mentioned to make vivid the profound impact that the social environment has had on the orientation of our science. Although there is nothing wrong with this sort of response to the historical situation, eventually the time ought to approach when enough knowledge has accrued to reduce the need for responding with research to emergencies as they arise and more study can independently be oriented toward improving the architecture of our knowledge. One of the side effects of responding continually to the dominant contemporary social issues is the sequence of turning suddenly to a major problem with absorbing interest and turning away from it entirely without having gained that lasting clarity that only the long and steady pull in research can attain. I mention as subjects that have suffered from this "hot and cold" treatment the effect of gold on farm prices, farm tenancy, population, and the diet of low-income groups.

In response to exogenous stimuli, it was inevitable not only that the scope of the area of inquiry in agricultural economics rapidly widened, resulting in more and more division of labor and branching into fields of specialization, but also that tools and methods had to be developed. The demand was mainly not for advice in terms of ideas and principles, but for guidance in terms of practical application. What came to be sought were tools for quantitative measurement of data, instruments with which to gauge elasticities or rigidities, sequencies of responses, and a multitude of other dynamic phenomena. The Europeans had proceeded largely with deduction. American agricultural economists from the outset distrusted the results of such reasoning and relied, as much as possible, on the inductive method. They put statistics to work to make all the facts concerning American agricultural resources, production, and marketing available. By way of contrast, when I came to the United States for the first time in 1929, Germany had no usuable data on the production of milk, although this was the greatest of all industries of the country. In the United States statistics and mathematical methods for analyzing data, relationships, and sequences were adopted or developed at an accelerating rate, particularly when governmental planning during the recovery period and World War II required the application of such devices. Today undoubtedly one of the unique national assets is our Yearbook of Agricultural Statistics, particularly with such parts as capital and income. No other nation has anything comparable to it.

II

In some quarters, considerable pride and sense of accomplishment are felt among agricultural economists in the rapid refinement of this mathematical methodology and its geometric and algebraic apparatus. In fact, not a few of our younger colleagues seem to feel satisfaction that the progress in this direction is gradually spelling out the distinction between an initiated caste of true scientists who have, and the amateurs who do not have this magic key for unlocking all secrets: the oldtime "literary economists." And indeed, there is a good deal of reason for feeling joy and pride in possessing tools for quantitative analysis of data and mathematical formulae and equations. In many instances they do yield useful information and results—within limits.

However, this elaborate maze of advanced analytical methodology is full of deceptive mirror-effects. It is easy to lose sight of the true essence of economics as one moves toward mastery of this methodology. Many have been disturbed because the test of controlled experiment and exact quantative measurement could not be applied in their pursuit of economics, and so doubted its rank as a science; they find this methodology reassuring. To them, my claim may seem absurd. Is it not true, they will say, that we are dealing with ascertainable facts which we treat with the most accurate, refined, and reliable mathematical methods? How can the reality of economic processes possibly escape our firm grip?

But let us drop the methodology for a moment. Economics—of which agricultural economics is merely a major branch—is concerned with immensurably more than the question of how certain goods or services can be produced at the least cost, how they can be made available at minimum cost to the consumer, or what the causal relations are between income, consumption, capital formation, and capital investment. Economics is concerned with a major part of human activities. It is a *social* science and thus has to deal with a realm far wider than the range of reality with which the natural sciences have to cope. Biology can deal at best with the static patterns of such social forms of life as the anthill and beehive. But even in the Diluvian Age man already possessed all the characteristics of the unique zoon politicon which uses reason, tools, and techniques and has social traits that differ from those of other creatures.

By no stretch of the imagination, and by no process of the most sophisticated reduction, is it possible to inject into the framework of biology the human actions with which we as economists are concerned. Experimental psychology and psychiatry can discover all sorts of characteristics, functions, and individual or group reactions, but these are not the sciences that cope with the human action that makes the course of history.

Within the scope of man's extraordinary capacity to alter the face of

nature according to his ideas, his ethical concepts such as justice and the dignity of man, and the use of his free will, lies particularly the creation of the sort of law and order that sets the stage for economic pursuits. He has made use of this equipment since prehistoric times. The part of human action that shapes the framework for the course of economic history also lies in the area that our science must grasp, understand, and make intelligible. If the gap between the natural and the social sciences has begun to narrow in recent years, it has been the result of the enormous gain in depth of comprehension of the mysterious phenomena of life in the borderlines between physics, chemistry, and biology. The very definition of what distinguished the life of organisms from the crystallographical growth of e.g. minerals, has brought the natural scientist's realm closer to analogies with such concepts as freedom of will.

If economics, then, is a social and humanistic science, it ought constantly to be keenly aware of the limitations of a methodology that can measure quantitative cause-and-effect relations only within a given set of circumstances and on the assumptions, historically invalid, that the values, motivations, and efforts of the people involved remain static.

With this, I return to mathematical tools for economic analysis. I might inject the remark here that while there has been rapid progress in the further refinement of mathematical expressions of economic theory and analysis in recent years, their introduction was not original with Jevons (1871), Walras (1874), Marshall (1890), Irving Fisher (1892), or Pareto (1902). Augustin Cournot introduced them in 1838, and von Thünen, in the second part of *The Isolated State* (published in 1850), had differential calculus to prove his doctrine of the natural wage. He whose economic thought is rooted in the cognition of the complexity, changeability, and essential freedom of human action will never become the captive of these tools. Keynes said: "Too large a proportion of recent 'mathematical' economics are mere concoctions, as imprecise as the initial assumptions they rest on, which allow the author to lose sight of the complexities and interdependencies of the real world in a maze of pretensions and unhelpful symbols."[1] How easily the venerated precision of the mathematical analysis (often applied to data from crude estimates) can trip the economist who leans exclusively on them has been illustrated time and again in the use of the correlation analysis for prognoses. Although the course of correctly calculated but utterly false forecasts since the end of the 1920's has reduced this uncritical use considerably, there are new areas where temptation to the same error is strong. The gauging of the elasticity of demand for commodities is being applied not only to

[1] John Maynard Keynes, *The General Theory of Employment, Interest and Money* (New York, 1936), p. 298.

domestic but to foreign markets as a guide to foreign trade policy—in an era in which the factors that underlie a certain "demand schedule" not only change almost day by day, but in which the active change of major factors by foreign economic policies is the real problem.[2] This points to the danger of slipping unwittingly into all sorts of deterministic notions that are utterly false, and a narrowing of the freedom of action and alternatives by default.

At this point I am anxious to divorce myself from any attempt to extend this criticism to the outlook work on commodity markets and even for farm income for the short range of a year as developed by the former Bureau of Agricultural Economics and which is being carried on by its successors in the Department of Agriculture. I consider this cautious projection of manifest tendencies into the near future as a most useful guide, so long as all concerned are aware of the nature of this device.

However, this is not my main concern. I see a genuine danger in excessive shift of emphasis in the training of agricultural economists toward more and more rigid requirements for the mastery of the mathematical exposition of problems and mathematical analysis. The mastery of these subjects absorbs a large enough part of the student's time in his college years to crowd out time needed for the many other essential areas of economics. The emphasis thus placed on method at the expense of substance cannot fail to have a serious impact on the approach to economic problems. One derives the impression, in following our literature of this sort, that to a considerable extent the highly technical manipulations squeeze the essential substance from economic subjects. Since we need research specialists with this sort of training, the answer must lie in recognizing this limited special need, but it need not be in shifting the general education of agricultural economists more and more in that direction.

The question for our profession is not whether to train economists in higher mathematical analysis, but how many of them to train, and what proportion of a department staff should consist of personnel with this training. Ignoring this optimal proportion may lead to a vast misallocation of human resources and the nation's capital, and to a generation of dissatisfaction for the misallocated talent as well. If this sort of error were committed under the seductive pressure of search for prestige, rather than through faulty judgment of future needs, something even more profound would be in jeopardy—namely, professional integrity.

Apart from this, it is a serious question whether, by selecting candidates for teaching or research jobs primarily according to their compe-

---

[2] Cf. E. Victor Morgan, "The Theory of Flexible Exchange Rates," *American Economic Review* (June 1955), pp. 279-95.

tence in mathematical analysis, there is any assurance that they have what is required of a competent economist. In this connection, I want to voice my concern about the growing tendency to select teachers, particularly for undergraduate institutions, according to published results of research. Certain essential qualities that make a good teacher need not be present in a first-rate researcher, and vice versa. Although there are men who have an ideal blend of both, it seems unwise to ignore the scarcity of this type. Dealing with historical and contemporary human action, economics has an epic quality that cannot fail to inspire and fascinate the ablest among the academic youth. To convey this is the task of the teacher, not the researcher—who can be a recluse and introvert, while still a contributor to economic science.

There is still another side to this: by choosing higher mathematics more and more not only as an analytical tool but as *the* form of expression, one removes economic thinking from the access and comprehension of the public. Although it seems to me poor general communication to say that "the demand slopes toward the right, while supply slopes almost toward the vertical," this is mere borrowing from specialized geometrical language. And equations cannot be discussed without chalk and blackboard or pencil and paper.

If it is said that in medicine or physics the scientist may also use methodology and language that no layman can understand. I would say that the analogy limps on several legs. It happens to be the essence of economics that it not only deals with human action and the lives and livelihood of people, but that in a democracy the people have a great deal to say about the rules of the game and the staking out of permissible latitude in such matters as competition or monopoly. Economic thought can guide the action of sovereign people and their decisions at the ballot box only in so far as they and their representatives in the legislatures understand economics. By retiring into the jungle of strictly professional forms of expression, one erects important psychological walls that separate the economist from the people. Precisely the opposite is necessary. While reflecting on this, I recalled with delight an evening spent in the Political Economy Club in New York in 1934. This small gathering of economists from Harvard, Yale, Columbia, and the New School for Social Research had as its guest the late John Maynard Keynes. He spoke on the economic strategy for achieving full recovery. The discussion lasted until the early hours of morning. Not once did I hear this great economist, in the exclusive company of members of the profession, use a single technical term. He spoke the plainest and clearest everyday English. In all this, let me emphasize that I do not mean to speak against the use of refined tools of analysis in research or the use of symbols in pro-

fessional journals—but to point to a potentially dangerous drift, which is not confined to this country alone.

A further trouble is that in the age of increasingly powerful bureaucracies in public and industrial administrations, through the medium of mathematics a great deal of thought expressed exclusively in physical terms of production, supply, or demand irrespective of price or cost can creep into supposed economic analysis without being recognized for what it is: mechanical engineering in goods or logistics of planning, but not economics. I have been baffled by the paradox that occasionally the presumptively objective mathematical analysis of economic phenomena conducted in high public offices has barely concealed strong social or political bias of those who make the analysis. This sprang not from the application of the method but from the assumptions underlying the analysis and the tacit exclusion of alternatives. Here the temptation to cross the boundary between the realms of politics and science is as great as in those places where these analytical tools are used in the search for decisions on policy and by order of the political authorities. Here the need of the sturdiest integrity arises in proportion to the use of mathematics. In economics many not quantifiable affairs are of extreme importance. To measure e.g. the dependence on a specific source of income in terms of percent of total income ignores the importance of the potential availability of alternative sources, which is not measurable.

III

Having said enough about an excess of emphasis on mathematics and quantitative measuring tools to arouse the indignation of many a good friend, it seems high time for me to state what, in my view, might be a more desirable orientation of agricultural economics.

To state it plainly, what distinguishes a science is neither the availability of tools nor the use of method, but creation of theory. By this term I do not mean its loose colloquial connotation of an individual view, speculation, or assumption, but a coherent intellectual framework of abstract principles that explains economic cause-and-effect relations and which, like an economic law, can be tested as to its validity by the observation of actual processes. In agricultural economics particularly there is decisive need for more theory to guide the further search into facts and to make its results meaningful and applicable by distilling abstract principles from concrete observation. The concrete reality of what actually occurs economically is economic history. Empirical research deals with it. But one cannot productively dig aimlessly into amorphous masses of data on phenomena, merely accumulating a larger and larger mass of facts. No one can arrive in that way at the dynamic principles of such involved proc-

esses as those of a highly advanced industrial economy or of its further development. Theory explains possibilities, necessary cause-effect sequences, emancipated from specific space or time. Theory is required to understand historical facts and data. Without theory the pattern of the rug that rolls off the loom of time makes no sense at all—as Macbeth put it, "a tale told by an idiot, full of sound and fury, signifying nothing."

Formation of theory requires, invariably, accurate knowledge of a great deal of observed detail. As in history, analogy is a method. But it calls for creative imagination, intuition, subtle judgment, and inventiveness to state hypotheses that, after much testing and trial of better ones, may lead to a theory. Within our discipline, testing excludes—except in the areas of marginal productivity analysis—the controlled experiment. Only by logic and supporting or contradictory empirical evidence can economic theory be tested as to its validity. Fully valid theory bestows full understanding of complex economic processes without full empirical study of all detail in each historical case.

The current gigantic output of monographic research reports scattered over the 48 states will, in my opinion, fail to survive even a few years of mostly regional usefulness. Only sublimation into theory could make the content of this literature survive in the intellectual inventory of the profession. But if this is to be done, this part of the formation of economic thought ought not to be suspect as unscientific, but recognized as its very essence.

In order to avoid the reproach of putting up vague postulates, let me say that there are large areas in which theory is needed as a guide and a frame of reference in agricultural economics. By definition, agriculture is the perfectly decentralized "industry" since it deals with the utilization of all land and water resources for food and fiber. American agriculture, with its unique two-billion-acre uniform market area has major "belts" of specific enterprises and regional specialization. Moreover, many products are produced 10 miles, 1,000 miles, 2,000 miles, or even 3,000 miles from a market, with the producer's share in the consumer price ranging all the way from 95 to 5 percent. That there are differences in quality or in time-utility involved does not invalidate the challenging phenomenon. Yet there is no developed and coherent theory of economic location in the United States that can claim to explain the coordination of factors lying behind the actual location of farm enterprises or the causes of shifting location. J. H. von Thünen published the nucleus of such a theory in 1826, which to this day is a most useful introduction to the economics of the farm enterprise as well as to the theory of intensity, and in Europe is still used as such. Among agricultural economists, Theodor Brinkmann and particularly Friedrich Aereboe further advanced the theory, while other

German general economists, such as Alfred Weber, E. Schuster, H. Schumacher, and H. Ritschl, and still others such as A. Predöhl and August Lösch, and the Scandinavians Bertil Ohlin and Tord Palander, contributed to general location theory. Perhaps, in the United States, the emphasis on interference with the principle of comparative advantage prohibits the application of true economics from erecting the theoretical structure for the pattern of division of labor in our agriculture. Perhaps the actual changes are so rapid that one is frustrated in trying to keep pace with them. But a multitude of local and regional studies are available or in the making which all contribute material for its creation. It is my misfortune not yet to have read the book by Edgar S. Dunn, Jr., *The Location of Agricultural Production*, which may fulfill the need I have mentioned.[3]

Let me mention another area where, in my view, the major theory is missing. One of the outstanding features of the economic structure and performance of American agriculture today is the vertical integration of a highly capitalized and capitalistically managed livestock industry with the use of land for crop production and forage. By an economy of abundance, the conversion of edible and inedible bulky staple commodities into mostly perishable livestock products acts as the balance wheel which, at very low social cost, reduces the impact of heavy fluctuations of the output of crops on the food household and the national economy. This system functions smoothly with a changing supply of specific livestock products and a consequent smaller variation in the diet of the consumer. Ultimately, it works through a very subtle shifting equilibrium price of livestock products at retail, i.e., through the intelligent budgeting and purchasing tactics of the housewife and the chefs in feeding establishments through the medium of flexible prices. This whole system represents a fascinating example of the most essential manifestation of economics. Yet a comprehensive theory of it is not available, notwithstanding Ezekiel's cobweb theorem, hog-and-cattle cycle analysis, studies on the livestock-feed price ratios as control mechanism, and many others. At the same time we have been hearing for years from various agricultural economists recommendations for a change that essentially would throw the whole system overboard by transferring the balancing role of the flexible livestock industry to a system of granaries, with the simultaneous "stabilization" of the output of livestock products—and a stabilization of prices of products and of the composition of the diet. All proposals of this sort appear to be the antithesis of economics. They belong in the engineering of physical inventories and thus basically in the logistics of a quartermaster corps. That such proposals can be made repeatedly is due largely to

[3] Having read the book since, I think it safe to say that despite its useful contents, the challenge remains unanswered.

the absence of a unified general theory of the livestock system. This conversion industry arrangement stands and falls with the rule of prices and costs and obedience to this rule all the way from the consumer to the beef-cattle rancher or the producer of broiler chickens. The theory would, in my view, show in essence the functioning of an almost classical market economy in which the many corrections applied by private and public interference dwindle to the insignificance of detail.

Let me touch upon another subject in which I believe theory, and I may say quantitative information as well, are lacking, although they are needed to keep abreast of what is going on. One significant achievement of American agricultural economics is that the process of shrinkage in the proportion of agricultural employment within national employment is generally recognized as a concomitant of economic development and rising agricultural income. It is obvious, however, that in spite of the net gain won, this process involves a constant marshalling of mineral, industrial, commercial, transport, and research resources for purposes of food and fiber production and a transfer of manpower from agricultural to nonagricultural resources. The developing industrial economy does not have agricultural production attached to it as a separate segment of a pie, but has vital parts of agricultural production interwoven into it. If the proportions of the food, feed, and fiber economy (for which we have only a few lump figures) and the exchange pattern with the other parts of the national economy were available, we would know a great deal more about the changing nature of our agricultural economy and the impact of maladjustments in it.

IV

In the few subjects I have mentioned it is inherent that economics must proceed from mingled empirical study and statement of hypotheses to testing of hypotheses and construction of theory if processes that actually occur are to be made comprehensible. Historical economic development precedes analysis and synthesis of theory. Only in a secondary way does the scientific comprehension become a part of the human action that results in economic development. It is well to recognize this priority of the men of action—the farmers, the businessmen, and all the others. Some of our colleagues seem to subscribe to the idea that American agriculture is not only aided, guided, and served by economists, but moves essentially under the command of science. I believe that this vastly overstates the case. To mention only a few items: (1) In the case of the extraordinary rise of the conversion of grain into chicken meat, a vast new integrated industry has been made possible by progress in animal nutrition and many other sciences. That it came into being however, was due to the alertness, initiative, and will to take risk on the part of thousands of small entrepreneurs acting under the influence of price, profit, and ex-

tremely easy credit terms. Progress was enhanced by the aid the feed-processing industry has given them. Economists neither foresaw nor generated this phenomenon of the growth of an industry, but observed and analyzed it. (2) In the last 15 years, American farming has suddenly began its sharp increase in output by intensification rather than by acreage expansion. This decisive change came about by adaptation to changed technological and economic conditions by several million farmers, not by strategic decisions by economists, although economists participated in the shaping of some of the economic conditions. (3) The revolution in irrigation by shifting to the sprinkler system has not come, so far as I can discern, through recommendations of economists, but through application on the farm under the influence of salesmen from the manufacturing companies.

But to go one step further with the notion that the time has come where our science must mature toward the development of theory, I believe that a theory of an even broader and more comprehensive scope is needed—that of the economic order as it evolves within the boundaries of the political constitution and social philosophy of a country.

So long as the economic order in western countries remained within relatively conventional boundaries, it may have been less essential to comprehend the characteristics of this order. But since the end of World War I the rise of the Soviet form of society has been creating an entirely new order. Its radical socio-economic doctrine derived from an economic school that branched off from Ricardian classical theory. After World War II this new order spread over enormous areas of the world.

The processes occurring in that sort of socio-political and economic order are in considerable degree governed by certain basic economic principles. But this new order definitely is not merely a deviation from economics as explored or understood in certain countries of Western Europe and in the United States. Again, Fascism in Italy, National Socialism in Germany, and Corporatism in Portugal have created still different systems of economic order. And in the West, which was not subjected to the Fascist experiment, the depression, too, found economic theory largely unprepared to cope with the severity of this social earthquake—exactly at the time when agricultural economics in America began to connect with and merge into the science of political economy that had had a history of several centuries in Europe and a remarkable and honorable one of at least two generations in the United States behind it.

Specifically, I believe that the theoretical counterpart of the distinctive economic order that has evolved in the United States and which is the setting for anything we are concerned with in our agricultural economics has not been constructed. Our economic order has grown under its own momentum and it has continually been changed by reform legislation, particularly between the depression and World War II. It has been

changed further under the impact of war and postwar events, and the undreamed-of expansion since 1940 is changing it in more aspects than can be, or at least have been, traced. While it is immeasurably complex by virtue of practical compromises, existing but not enforced laws, and the coexistence of federal and state legislation, the economic order of the United States today has nevertheless, by comparison with other orders, very distinctive structural features. Efforts have been made to sketch outlines of specific parts of the order, such as, to name only a few, Gardiner Means's theory of flexibility of farm prices *vs.* rigidity of industrial prices, or the theory of monopolistic competition by Chamberlin and the economics of imperfect competition by Mrs. Robinson. All of these are efforts to correct the conceptual framework of the competitive market economy as predepression economics accepted it. Theodore Schultz, with *Agriculture in an Unstable Economy,* did a great deal to elucidate certain phases of the dynamics of the modern economy. Yet it seems to turn out to be far too static to depict the behavioral pattern. Galbraith's theory of counterveiling power is the most ambitious effort to present an X-ray projection of what this economic order is. But to stay with this metaphor, it may take many X-rays from different angles and with different techniques to show the circulatory system and its control mechanisms. So far Galbraith's theory of the American economic order has been criticized and major assumptions have been challenged. But the real challenge can only take the form of more compelling theory. It is still missing. Perhaps the new emphasis in research on development, which did not precede, but followed, the actual development, will fill this gap. In the absence of a commanding and generally accepted theoretical and conceptual framework of our economic order and in the presence of partial hypotheses that focus on the limitations of competition, I notice throughout our profession a wholesome appreciation of the substantial amount of competition, willingness to take risk, and to work under the impact of prices. Implicit in this strong feeling is the tacit recognition that theory does not yet comprehend the complexity of the true "order" of this extraordinarily vital and strong economy of ours. But this situation is highly uncomfortable and must be overcome.

The war and the postwar periods have given hundreds of agricultural economists the new experience of going on foreign missions into distant countries and colonies. They have been confronted with economies in widely different stages of development, with diverse political and social systems, and cultures having values and motivations different from our own. This contrast, stimulating thought by comparison, has prompted the search for a theory that crystalizes whatever core of abstract economic principles may remain valid even in social systems different from ours. These missions into strange political and social environments, addition-

ally, provide many startling examples of how facts contradict accustomed patterns of explanation of development in one place and stagnation in another. This experience has inevitably given considerably greater scope and depth of thought to our profession in discerning the nature of economic problems. It comes not only by facing concrete evidence of economic porcesses within different social environments, but also by the accidental contact and cooperation with scholars from other disciplines.

V

If it should be a sound endeavor to orient economics more toward theory, I doubt that concentration on methodology will help. While it has been much stressed in the past that any science worthy of its name must be concerned with methodology, it also seems possible that preoccupation with methodology may be a sign of a science's decay. More exchange of thought with general economists, and discourse on problems of economic development with researchers in other disciplines such as philosophy, logic, philosophy of law, jurisprudence, political science, economic history, and anthropology will not only widen horizons but give by analogy or transposition a firmer grasp of what economics is and what it cannot be. It cannot be the arbiter of values for society and it cannot decide what ought to be done. To establish this contact with other disciplines a deliberate effort toward orientation may be made, and our Association could be the catalyst.

Agricultural economics will gain in stature and influence if, as one of the disciplines in the realm of the humanities, it sets its sights high and keeps aware of the fact that its subject is concerned with cause and effect relations in human and social action, and that this involves far more than material needs. Let us suppose that we have a generation without a major war ahead of us, and that the imagination, energy, and drive of the nations can to a larger extent be allocated to and absorbed by efforts toward accelerated economic development. The changes brought about in the economic and social spheres will be breathtaking, and call for bold perception of the macroeconomic problems. The actual pace of economic progress may overtake the economic profession just as the stalling of investment, exchange, and employment caught it unprepared in the great depression. In such a period of economic growth as may lie ahead, problems of maladjustment may become even more severe, but their nature will be dynamic—such as disparity in pace of development—and their susceptibility to remedial action will be greater. All this argues for more alertness in our profession to the strategy to be employed in allocating our human research resources, a firmed understanding of the economic order as a whole, and strengthening of the will to create theory, or, as I prefer to say: to complement analysis by synthesis.

ECONOMIC GROWTH AND DEVELOPMENT

Chairman: Joseph Ackerman, Farm Foundation

CONDITIONS AND RATES OF ECONOMIC GROWTH

HOWARD S. ELLIS
University of California

DOES Economics possess a theory of economic growth? It would, indeed, be a sad commentary upon its accomplishments if it does not, for, from the first line of print in *The Wealth of Nations*, "Of the causes of improvement in the productive powers of labor," down at least to the marginalist school—a full century—and from the end of the last war to the present day, the problem of economic growth has been one of our main preoccupations. Other great economic problems do not lack theoretical explanation. Sometimes indeed, as in the case of economic fluctuations, we may even suffer from an embarrassment of riches; but we believe we can offer satisfactory explanations of why and how these variations occur. Less richly endowed, it is true, the theory of distribution nevertheless goes far in accounting for the facts. And marginal analysis, which the theory of linear programming has lately transformed into a dynamic general equilibrium analysis, affords an intellectually satisfying explanation of the allocation of productive resources.

I should like to propose a short voyage of discovery through the literature to see whether or not a theory of economic growth does exist. We shall need to traverse five broad areas: economic history, statistical analysis, theory, comparative statics, and eclectic synthesis. These are not water-tight compartments. I do not, however, propose to emphasize taxonomy but rather the substance of the various approaches and their net yield. Within the confines of a single lecture, these approaches will have to be treated merely by a sampling or illustrative method.

I

To the first of five explanations of economic development, the historical, belongs the theory of progress of the Classical economists. It described the behavior of income shares through time in progression toward the stationary state. Whether this theory purported to describe an actual historical process or merely set forth what would happen if accumulation outstripped improvement, or alternatively if population outstripped both, depended upon the individual writer, and some were not too clear. Interpreted in either way, however, it scarcely seems compatible with contemporary ideas of more or less indefinite progress, because of the

emphasis that the Classical economists laid upon land (in the broad sense of natural resources) as the ultimate limitational factor.

The current scene seems to be imbued with optimism regarding the efficacy of improved genetic and extractive techniques to offset diminishing returns. Indeed, the Harrod-Domar growth models, to which I come later, dispense with diminishing returns completely. This is said to be merely a simplifying analytical device, not an assertion of fact. As for the facts, Smith, Malthus, and many other Classical writers were careful students of history and did not spin their theories in a vacuum. There is no need to dwell upon this familiar terrain; but, despite our optimism, have we forever bade farewell to the "ghost of Malthus"? Certainly the situation of the underdeveloped countries, where annual rates of population increase often reach 3%, enough to absorb a 9%-12% increase of G.N.P., is anything but reassuring. Even with the population increase rates of the economically developed world, have diminishing returns on natural resources been banned from the scene?

Another ghost from the Classical theory of progress has recently escaped from the charnel house where it was imprisoned by Keynesian economists: that production creates its own vent. The idea seems to be winning more and more acceptance that the secret of development–if there is any one formula–is the expansion of the domestic market and mass purchasing power. For this the prime requisite is *production*–production correctly oriented toward producers' and consumers' needs–in other words "balanced growth." If deficient demand episodically or cyclicly plagues the more developed economies, deficient output chronically besets the underdeveloped areas. Thus Say's law, as Ragnar Nurkse argues, comes into its own for underdeveloped areas, I may add that it comes into its own again for the advanced economies aside from depressions.

Within the past half year, W. Arthur Lewis has proposed to apply the Classical theory, with what he regards as rigorous simplicity, to overpopulated underdeveloped areas. Surplus agricultural labor can be transferred to industrial development projects; but since agriculture is already saturated with labor, food supply is constant, and the newly-won income of labor in industry results in inflation. Profits rise but wages remain at subsistence. Initially, therefore, development is financed from forced saving; but as incomes increase, voluntary saving also rises; and finally, with a continuation of the transfer of surplus labor to industry and the increase of output, voluntary saving finances the development process completely, without inflation.

I am not prepared to accept this very unorthodox twist which Lewis gives to the Classical tenets of subsistence wages, with profits as the

source of capital and capital (the "wage fund") as the source of progress. Under modern conditions, say in Argentina, even with redundant labor and subsistence wages in agriculture, money wages in industry are apt, through government or union action, to follow hard on the heels of commodity prices. Inflation may temporarily finance expansion through forced saving. But against the increase of forced saving must be set the reduction that inflation entails upon voluntary saving; windfall profits go partly to consumption; trading for speculative gains partly supplants production; and investment goes into dubiously productive channels. Lewis has not provided a tenable theory of development because, on balance, inflation retards the process.

Karl Marx took the Classical theory as the basis of his prognosis for capitalism. But in the United States, which, according to Pravda and the stagnation theory, is the most mature of the capitalist economies, we do not see clear evidence of increasing monopolistic concentration of power. The proletarians are becoming middle class rather than the contrary, and the March 1951 accord between the Treasury and Federal Reserve—if I may be permitted a bit of exaggeration—may give grounds for hope that we shall not finally collapse through worse and worse business cycles. In other dimension also, the prophesy of Marx has been belied, possibly to the dismay of the less developed economies. Saving and investment in the capitalist countries are not forcing down profits to the point where capitalist governments must engage in imperialistic exploits to save the day. The problem is just the reverse: how to entice private capital away from the attractions of the domestic economies of the United States and Western Europe into the newly developing continents.

Although Schumpeter shared some of the dire forebodings of Marx regarding the final outcome of capitalist development, he is chiefly distinguished for his theory of progress through the innovating entrepreneur. I cannot pause to consider the interesting question as to whether or not the optimism of *The Theory of Economic Development* and the pessimism of *Capitalism, Socialism, and Democracy* are theoretically compatible, or the momentous question as to whether or not, in fact, optimism or pessimism should prevail. Suffice it to say that technological improvement supplies contemporary theories of development with their most important single element. Economic historians, such as Habakkuk and Gerschenkron, never weary of emphasis on the entrepreneur, and not mere capital accumulation, as the moving cause in the recorded growth of the developed economies.

Consider also the economically undeveloped world, embracing two-third of the world's 2.4 billion inhabitants, for which the designation "non-Schumpeterian" has been employed. The designation is justified in so

far as indigenous innovation is not conspicuous in these economies, and in so far also as the introduction of new combinations—being in part controlled by outside agencies or home governments—does not necessarily follow a wave-like course. But this world also is Schumpeterian in that it would be difficult to assign to any other single factor a more dynamic role than to innovations introduced from without.

Thus far we have been concerned only with those rather grandiose generalizations that might be called historical-philosophical theories of economic development. The great bulk of economic history, however, is not of this sort. For the most part it is concerned with the record of a particular country or region. If it is history and not a mere chronicle, it seeks to explain *why* development did or did not appear, and what conditioned the rates of progress. Of necessity it covers a wide terrain, not only of economic facts such as techniques, relative supplies of factors, economic organization, foreign and domestic trade, economic motivation, taxes, tariffs, monetary phenomena, and so on endlessly; but also, physical elements, such as topography, climate, public health; and, finally, the political, cultural, moral, and religious factors.

Occasionally its authors do not venture generalizations concerning economic progress even for the specific period and region involved. Whether they do so or not, the substance of these enquiries actually supplies (or should supply) the raw material for the historical-philosophical, statistical, theoretical, comparative static, and synthetic approaches. Thus the end product of economic history in explanations or theories is often to be found outside the history books themselves.

One lesson to be drawn from the history of conspicuous modern instances of rapid economic development—Japan after 1868, Germany after 1870, and Russia after 1917—is the relatively great role played by the state in fostering or operating new projects and forcing the pace of development through appropriating or taxing away the agricultural surplus. But a part of the lesson, illustrated as well by Germany, Japan, or contemporary Mexico, is that a beginning after this fashion does not commit the country to socialism in the long run.

Still more important, economic history represents the main channel through which the vast sea of non-economic forces—political, social, cultural, demographic, etc.—pours in upon the explanation of economic development. One might almost be tempted to announced a political theory of economic development in view of the history of Japan after the restoration of the Meiji, Germany after the unification, Russia after the revolution, as well as the burgeoning of development plans in South and Southeast Asia and the Near and Middle East with the breaking up of the empires. In other cases—the English industrial revolution and its

spread throughout Europe and North America, as well as the histories of Australia, New Zealand, and South Africa—the political factor might well assume less importance. Be that as it may, in all cases one is probably on safe ground in attributing to the nexus of noneconomic factors in the aggregate an importance that equals or transcends that of the economic factors in the aggregate.

II

Since statistics and econometrics can be regarded essentially as quantitative economic history, the transition to this approach to economic growth is not difficult. Wide variety and sharp contrasts mark the analysis in this field, and I am constrained merely to illustrate. From almost any angle—extent of knowledge, penetration of judgement, volume of work in this field—the name of Kuznets stands forth; but he is also outstanding for his reluctance to draw conclusions as to cause and effect. His extensive research has led to emphasis upon acceleration followed by deceleration of growth rates in population, per capita income, and capital formation, with a clear lag of the second behind the first. One has the feeling that Kuznets would probably regard population increase and capital accumulation as prime movers in economic progress, but he does not say so. A most interesting finding is that the ratio of capital stock to output, having risen in Great Britain and the United States in the late nineteenth and early twentieth centuries, has latterly ceased to rise. Kuznets suggests that this may be the result of innovations that are cheap in terms of capital and of the investment of capital, under modern conditions, in human health, education, and skills. Almost the only categoric statement about the *causes* of progress is one that may be of particular interest in the present setting: "a technological revolution in agriculture is an indispensible base of modern economic growth," a statement applied to both old and newly developing countries.

A somewhat bolder figure in the use of statistics is Colin Clark. But this courage reveals itself less in generalization as to the mainsprings of economic progress than in statistical projections. By inference, population growth, capital accumulation, migration, economic stability, and a free and abundant international flow of capital are the chief growth factors. The attention of economists has focussed chiefly upon his prediction of a progressive improvement of terms of exchange of primary against manufactured goods, which would (if valid) bear intimately upon the direction of economic development in major sectors of the world, without however revealing its causes and conditions.

Long run projection of output by means of the ratio of capital to output has been intensively studied by William Fellner. Analysis of this

sort takes its point of departure from the *ex post* identity of savings and investment and from the fact that the percentage increase of output multiplied by the capital-output ratio at the margin equals the proportion of output invested. The reliability of forecasts based upon this model depends upon the stability of the average propensity to save.

Fellner strongly emphasizes the dependence of these projections upon stability in a large number of factors that lie behind the magnitudes involved in the equation: price-wage relations, the particular composition of output, interest rates, money surplus, foreign trade, etc.—all of which can be influenced more or less by policy. Thus a good deal of the atmosphere of inevitability—inevitable recession or boom as actual investment falls short of or exceeds the equilibrium rate of investment—disappears. The equilibrium rate itself no longer appears an inflexible datum, although, if it is successfully projected, it does represent an important constraint upon policy. Since stability undoubtedly is an essential condition of economic growth and since investment constitutes a large part of growth itself, these enquiries lie very close to the center of the subject. They have not yet produced a theory beyond the truth that increased output induces more saving and investment and these in turn induce more output.

Another important statistical approach to economic development is linear programing, which has been applied to both underdeveloped and advanced economies. External economies, although they can be shown graphically in a downward sloping cost function in a partial equilibrium diagram, cannot be captured statistically by partial equilibrium analysis because the costs of one good depend functionally on the decline of costs throughout the system. Linear programing is thus a superior instrument to the simpler marginal cost procedure when economic growth realizes external economies. For underdeveloped countries this is particularly important for two reasons. First, external economics are probably quantitatively significant. Second, ignoring them as the static marginal analysis may do, leads to a quantitative overestimate of investment required for primary production and basic industries relative to consumers goods, thus intensifying the spontaneous desire, so evident in many underdeveloped regions, for ostentatious heavy industry.

Linear programing is also able, as Hollis Chenery shows, to take account of the fact that, in overpopulated underdeveloped areas, the social opportunity cost of employing labor otherwise idle may be less than the wage. Of course, linear programing cannot introduce the many cultural conditions for progress, and its fixed production functions leave out the crucial element of technological innovation. Still more important for underdeveloped areas is the paucity and unreliability of statistical data.

Probably all that can be said is that linear programing is superior to the partial equilibrium marginal analysis. It relates to one important aspect of growth, the correct allocation of factors.

The idea of *balanced* growth, which is essentially a matter of correct factor allocation, is probably more important for the more than for the less developed country, because the advanced economy is marked by a highly sensitive intercommunication of markets. When, then, an econometric model of growth in the United States over 16 decades is constructed by Valivanis that excludes both business cycles and all trends except population increase, one is led to agree with T. C. Schelling that most of the real problems of balance and growth have been omitted.

III

Under the "pure theories" of economic growth[1] I shall treat certain explanations that do not appeal primarily to history or to statistical evidence, but that proceed rather by deduction from assumed premises.

Keynesian theory has, thus far at least, not yielded fruitful results when applied to the problem of growth. For the underdeveloped areas it is, as Mrs. Robinson has forcefully declared, simply not applicable because it concerns a setting in which capital equipment (temporarily, at least) is not scarce, and where laborers can be set to work in the factories by creating effective demand. In the underdeveloped areas, the factories do not exist and the problem turns on the means of bringing them into being. Arthur Lewis' is the only theoretical attempt I have encountered to make monetary expansion, even if it is inflationary, the engine of development in communities where the strategic factor is the shortage of capital.

I do not propose to look systematically into the use made of Keynes' analysis by Hansen to produce a *stagnation theory of economic* development for advanced economies. This somewhat startingly paradoxical phrase seems, however, to be worth a moment's attention. Hansen has frequently asserted that there is an "underlying tendency" for the economy of the United States to run down because of the propensity to save, on the one hand, and certain demographic, institutional, and technological factors, on the other. Just as frequently, however, he puts the matter conditionally: If "adequate outlets to saving" are not available, income and employment will decline. I do not feel certain that he is predicting the decline of capitalism. Interpreting in this way, we might con-

[1] We might of course swell the ranks of its representatives by including Marx and Schumpeter; but I subscribe to the commonly accepted view that these authors produced rather philosophies of history. Arthur Lewis' theory of development by inflation might more logically have been reserved for the "pure theory" category, since it does not appeal to historical evidence but to the abstract apparatus of the Classical school, and for convenience I chose to treat it in that context.

clude—as many economists have—that while the "stagnation hypothesis" cannot be proven or disproven as a historical hypothesis, it does point to certain important factors that must be favorable to investment if progress shall continue.

Thus a good deal more attention might be given to Hansen's demographic factor. Why is an increase of population a *plus* factor in the inducement to invest in the United States, whereas by common consent it constitutes a bar to progress in the underdeveloped world? When are there enough people? Or, to get away from the Classical static diminishing return viewpoint, must population increase if the economy is to progress, and if so, how fast? This question is scarcely ever proposed, and never— so far as I know—answered. Closely related would be the theoretical inwardness of capital deepening, which seems to be more genuinely indicative of economic progress than mere widening, though often assumed to be more difficult to achieve. Is such a difficulty compatible with rising real wages and the pervasive pressure in the United States toward *labor* saving techniques? And so theoretical scrutiny should proceed from all stagnationist obstacles to the investment propensity.

Keynesian theory has been involved in two other quite separate lines of theorizing pertaining in some way to economic development: one, the trade cycle analysis of Hicks; the other, the growth models of Harrod and Domar. With Hicks, the critical factor called the "equilibrium path of growth of output" depends in part upon the rate of autonomous investment. But little or nothing is said about what forces explain the magnitude of autonomous investment. In the end we are left with an empty formula. Harrod and Domar construct models of economic growth that are at first puzzling because they abstract from diminishing returns, varying combinations of factors, varying growth rates of income, unemployment of labor vs. employment of capital—in short some of the principal questions of development economics.

The explanation of these heroically simplifying assumptions is that the authors direct their attention—not to the determinants of growth—but to what rate of investment is "necessary" to maintain full employment at a stable growth rate. The upshot of the Hicks, Harrod, and Domar effort has been that contemporary theorizing about growth in *developed* economies has not really addressed itself to the topic of the present lecture.

Contemporary theories concerning economic growth in the *underdeveloped* areas, having at least the merit of addressing themselves to basic determinants, are not always very convincing. One line of thought, pursued by Maurice Dobb and Rosenstein-Rodan, and generally received with acclaim in the underdeveloped areas themselves, is that if economic development is really to "come off" at all, it must be *rapid*. Dobb's argu-

ment, the less sophisticated of the two, rests partly upon economies of scale, external economies, and the idea that, if small-scale capital-saving installations are launched, they will be inappropriate by the time they come into production. Rosenstein-Rodan holds that expansion must be pressed hard in order to break through certain discontinuities or rigidities. Theories of this sort argue that if voluntary saving is to contribute significantly to development, national income must rise steeply before aggregate consumption overtakes and dissipates it. Or to the degree to which consumption does rise, the advance of both income and consumption must outstrip population increase in order to establish higher standards of living and curb the rise of natality. From a technological angle a burst of investment, particularly in the basic utilities, is necessary to afford private investment the necessary milieu for profit making. Finally only rapid advance can dislodge the cultural adhesions that inhibit economic development.

These considerations cannot be dismissed lightly, but they fall far short of demonstrating the thesis that progress is either rapid or absent. With the demographic factor it probably takes on its greatest force. But even here the historical record, as illustrated by Japan and even Western Europe, reveals a very slow adjustment of standards of living to increased productivity. In the underdeveloped world, with its high rates of population increase often superimposed upon marked degrees of overpopulation, the income-increase therapy may be quite insufficient and may require supplements on the side of family limitation.

The technological argument for attempting high-speed development, on the other hand, is unconvincing. External economies may exist, but high speed may involve misallocation of investment funds and cancel out the potential external economies and advantages of scale. In other words, attempts at forced-draft development may fail to achieve balanced growth as indicated by marginal productivity, or better—abstractly at least—by linear programing. And finally, domestic economic change, as witnessed by the current situation of South Africa and Indonesia, for example, may entail dreadful social costs and, furthermore, may undermine the very prospect of economic advance itself.

I would not dwell upon these purported arguments for rapid economic expansion in underdeveloped areas had I not detected parallel reasoning occasionally regarding economic progress in the U.S. During the recent recession, C.I.O. economists, Alvin Hansen, and others predicted dire wastage of manpower and capital capacity if G.N.P. did not continuously rise at a "warranted" or "realizable" potential rate. Here the theory of economic growth seems to degenerate into mere statistical projection. By carrying forward a growth curve as a dotted line leaping over the slight

declevity or deep gulf of a recession or depression, it ignores that growth may have to take a new point of departure. By setting very high objectives for the continuity and rate of G.N.P. growth it leads to excessive demands upon the performance of the economy and instills a bias for excessive intervention. We have, long since, cashiered the idea expressed by Schumpeter in *The Theory of Economic Development*, fixing his eye upon real wages (of those still employed!), that "depression brings to fruition the promise of the boom." But have we gone so far as completely to reject the idea of growth by waves, of the possible recuperative and consolidating effect of temporary pauses in growth and even of minor reversals of direction? It there no danger that continuous full-employment growth may—as A. G. Hart has recently argued—entail inflation, and that inflation and the weakening of entrepreneur and labor morale may actually impede advance?

IV

"Comparative statics" refers to the analysis of conditions and attainable rates of economic progress by cross comparisons of two economies at the same point of time, or of one economy or two economies at different points of time. Most frequently this method has been utilized in both time dimensions as a method of revealing which of the elements lacking in the *underdeveloped* world account for its failure to progress economically. When an underdeveloped economy is compared with the *present* economy of the United States there is apt to result a bias in the direction of overly ambitious goals. The Bombay plan for the development of India illustrated this error.

This bias appears less frequently when the situation of the presently developed economies prior to their great eras of economic advance is compared with the situation of underdeveloped countries *now*. Studies of this sort almost invariably reveal that the developed economies of the West (Europe and European culture countries elsewhere) were not only much more advanced economically *then* than the presently underdeveloped areas are *now*, but that their characteristics were much more favorable to further gains. Thus Habakkuk points out that by the early eighteenth century, many parts of Europe "already had in some measure many of the facilities, the absence of which is often supposed to account for the failure of backward areas of the present day to generate progress" —transport facilities, credit, skilled labor, acquisitive attitudes, etc. In addition, conditions favored further progress. The English state did not intervene to prevent the discarding of outmoded techniques. Social mobility was adequate for the times. Conditions were auspicious for the expansion of the domestic market, with relatively high per-capita in-

comes, a low proclevity toward leisure, and a strong propensity to consume standard and substantial goods rather than luxuries. In large measure, these were traceable to the quantitative importance of the middle class.

Occasionally it is profitable to *reverse* this method of comparative statics in order to draw inferences concerning the conditions for progress in, say, the United States. The advanced nation learns something about economic growth by examining the reasons for the absence of progress elsewhere. Still more may be revealed by a comparison of the advanced economy with its situation one, two, or several centuries earlier. Such comparisons often tend to take some of the current emphasis away from machines and techniques, and to highlight ideologies, social and political arrangements, incentives, etc. We learn to attribute more to the cultural inheritance of the Renaissance, Reformation, and Enlightenment, the ideal of the open society, the scientific—as against the fatalistic—approach to human ills, the emphasis upon the individual, the disappearance of caste, guild, and feudal immobility. Comparisons of this sort may prompt the question in the contemporary American scene as to whether or not there are retrogressive tendencies in the cultural environment. Economic progress cannot be ground out by machinery, nor can it be enjoyed by robots.

V

The analytical-synthetic approach draws upon history, statistics and econometrics, theory, and comparisons of economies; and it offers the opportunity to draw some general conclusions. Do not the outlines of a theory of the conditions and rates of economic development begin to appear from the terrain we have traversed?

An essential part of reaching positive conclusions is the clearing away of extraneous and implausible theories. If the evidence adduced in earlier parts of this lecture is acceptable, capital formation, which Abramovitz correctly puts at the center of material progress, responds more sensitively to the inducement to invest than to mere accumulation, however indispensable saving may be. As the Classical economists argued, mere accumulation, in and of itself, would bid fair to usher in the stationary state. To this generalization, as to all useful generalizations that are not mere truisms, there are probably exceptions. The Mercantilist economists in England never tired of expressing their envy of the abundance of capital and the low interest rates in Holland as the cause of its greater prosperity.

Monetary expansion likewise is rather the handmaiden than the agent of progress. Monetary-fiscal policies should, of course, be used to offset recessionary movements of episodic nature in an economy well pro-

visioned with capital capacity. But deliberate inflation as a policy, even if "gentle" inflation, reduces voluntary saving and distorts and wastes investment.

Aside from the propositions that investment must in any economy be productive (or "balanced") and not exceed a noninflationary rate, not many of the newest attempts to describe a maximum or optimum rate of investment really succeed. It cannot be demonstrated, as Dobb, Rosenstein-Rodan, and others have sought to do, that development fails to materialize unless investment is "rapid." Hicks' model of the trade cycle in a setting of secular advance is internally consistent, but his equilibrium rate of growth simply posits and does not explain a certain amount of autonomous investment. Finally the Harrod-Domar construction fails to prove that there exists for each economy with its given complement of capital goods a unique rate of capital formation that satisfies the requirements of equilibrium, though it may indicate the direction in which adjustment is required.

What then are the primary conditions of economic development? Our survey has pointed especially to four moving causes: innovation; cultural factors, of which the chief seems to be political; third, the autonomous factor of "balanced growth"; and fourth, the increase of population in countries not already overpopulated. Innovation must be interpreted in the broad sense indicated by Schumpeter. Beside the practical application of scientific discoveries and the improvement of machines, it includes better communication, transport, marketing and credit facilities, more efficient business organization, new products, labor- or other resource-saving processes, etc. Whether developed within an economy or appropriately adapted from abroad, these supply one of the really primary causes of development.

Another prime mover, according to historical record, inheres in the newly-won political independence of a region from outside rule or the liberation of the mass of the population from domination by a minority within the country, often a small and oppressive minority. Presumably other cultural factors can at times become prime movers, such as the emulation of higher (foreign) standards of living. Of course, many cultural factors must be included among the *necessary conditions* of progress. But not many seem to be capable of actually inaugurating and pushing forward economic growth. The assertion of political independence usually involves, however, a powerful drive toward economic independence and material improvement.

It may appear that "balanced growth," which Ragnar Nurke has most fully expanded upon as a source of progress, is in fact merely a background or conditioning factor. Thus, it may be said, even if the expansion

of gross national product goes partly wrong, it may nevertheless expand. But the difference between conditions for the *appearance* and factors controlling the *rate* of growth is rather tenuous. "Balance," or the correct allocation of factors by reference to productivity or linear programming, conditions both appearance and rate. More important still, production, provided it follows the directions of relative demand, does create its own vent and is autonomous in a most fundamental sense. It rests upon the basic economic motive to produce, consume, and possess more.[2]

The increase of population in countries not already overpopulated may arise through an excess of birth over death rates or by immigration, and it may be international or merely domestic. In any event it brings in a powerfully dynamic demand for housing and other facilities; and investment by capital widening of this sort usually finds less obstacles than by intensification. If population increase occurs by immigration, there may be added stimulants to growth through the irruption of new ideas, techniques, and social change. But population increase can scarcely be envisaged indefinitely as a cause of progress.

Among the four prime movers it would be difficult and probably unnecessary to decide which is the *most* active cause of economic progress. That the autonomous urge to produce more, working through a balanced expansion of output, is the most *general* force scarcely seems subject to doubt. It could vastly expand output with only a modicum of innovation with the large supplies of surplus agricultural labor available in most underdeveloped economies. In developed economies it still supplies the fundamental motivation and condition of progress, although innovation appears as the more powerful accelerator.

From this point forward, most of the elements of progress appear rather in the role of more and less important *conditions* than as active agents. Stable and honest government, immunity from violent fluctuations of output and prices, the existence of an adequate base of public utilities and services—these and kindred matters would seem to be almost universally necessary to development. Probably the existence of a substantial middle class constitutes a nearly-ubliquitous condition for the expansion of domestic markets. But even when we consider something as essential as the supply of resources, the effective limiting factor may differ greatly in various countries as among capital, labor (including skilled labor and managers), entrepreneurial talent, and natural resources. Still further variety and specificity will attach to the host of demographic, cultural, political, social, and religious factors, any of which in particular situa-

[2] Smith, as everyone knows, referred to a fundamental "propensity to truck, barter, and exchange," but Smith was talking about the division of labor rather than the motive to produce.

tions may assume critical importance. Starvation and disease may be basic in one country and overindulgence and "too much prosperity" in another; and so on, *ad infinitum*. Filling in the specific requirements of a given country also fills in and completes the theory of economic development appropriate to that setting.

The sort of theory of development that has been indicated here is perhaps of a lower order of generality than that to which some economists would aspire. In a sense it represents a compromise with those who, like Kuznets, seem to feel sceptical as to whether or not *any* generalizations can be established. On the one hand it does venture to lay down some fundamental principles, and hence qualifies as theory. On the other hand, in attempting to take account of a number of economic and noneconomic factors, it may be richer, more flexible, and more realistic than any single formula. This seems to be the current tendency in price theory, business cycle analysis, and even the theory of employment. Should we sigh nostalgically for simpler formulas?

CONTRIBUTIONS OF AGRICULTURAL POLICIES TO GENERAL ECONOMIC GROWTH*

FREDERICK V. WAUGH AND JAMES P. CAVIN
Agricultural Marketing Service

I

CURRENT economic literature is full of discussions of "general economic growth," "economic development," or "sustained economic progress." The title of our paper mentions growth. Dr. Joseph S. Davis has pointed out to us that growth and progress are not synonymous—that we could grow without progressing. We shall assume that our policies should be designed to promote both growth and progress. More specifically, we suggest three goals: (1) an increase in the *per capita* output of goods and services, (2) a reasonably steady rate of increase (i.e. with no serious booms nor depressions) and (3) an improvement in levels of living shared by all groups in our population.

There is virtually universal agreement on these goals. But there is not full agreement as to how to reach them. True, most economists now agree that we need some sort of positive economic program. They are not satisfied with a mechanical extrapolation of the gross national product to show what remarkable gains could be made in 10, 20, or 50 years. They want to know what programs and policies are likely to be most effective in reaching the goals. In the present state of economic knowledge, there is room for honest differences of judgment on this point.

For example, Dr. Arthur F. Burns[1] states:

> Today it is no longer a matter of serious controversy whether the government should play a positive role in helping to maintain a high level of economic activity. Men and women in all walks of life, and in both of our political parties, now generally agree that economic storms of inflation and depression must not be left to run their own course. What we debate nowadays is not the need for controlling business cycles, but rather the nature of governmental action, its timing, and its extent. Even on these matters we have won greater agreement than seemed likely only a short time ago.

One of the areas needing clarification is that of agricultural policy. To some "agricultural fundamentalists" farm policy is the key to general economic policy. At the other extreme, we sometimes hear it said that agricultural policy has little to contribute to sustained economic progress. We disagree with both of these extreme views. We believe that agricultural policy can contribute (and has contributed) significantly to general economic growth.

---

* The views expressed in this paper are those of the authors.

[1] Arthur F. Burns, "What is the Role of Government in Moderating Business Fluctuations?" Address before the Economic Club of Detroit. Oct. 18, 1954.

Our purpose today is not to exaggerate the importance of farm policy. We doubtless need a well-rounded set of policies for national economic growth. The agricultural policies are only one part of the whole, but we think they are by no means an unimportant part.

II

We have already remarked that economists are not satisfied with mechanical projections of output and consumption. Yet such projections give us a useful start in studying problems of growth.

It is perhaps worth noting here that, over a period of many years, economists in the Department of Agriculture have given considerable attention to long-range projections of agricultural output and consumption. The *1921 Yearbook of Agriculture* contains a report by L. C. Gray, O. E. Baker and others, entitled "Utilization of Our Lands for Crops, Pasture, and Forests." In this study, the authors projected land requirements in the United States to around 1950, using a population estimate of about 150 million people and alternative assumptions as to per capita consumption and crop yields. In 1940, an interbureau committee and the Bureau of Agricultural Economics published a report, *Technology on the Farm*, which not only attempted to appraise the effects of advancing technology on agriculture, but also the implications of technological development in agriculture on the national economy. Unfortunately, the existence of a high level of apparently chronic unemployment prevented many of the findings of this report from resulting in positive recommendations that would promote general economic growth. In fact, this report somewhat wistfully states that "in our consideration of problems and remedies, we should not assume that industrial expansion . . . has ceased for all time." The approaching end of World War II brought renewal of interest in long-range prospects for agriculture.

In 1945, the Bureau of Agricultural Economics published a series of bulletins entitled, *What Peace Can Mean to American Farmers*. The first of these, "Postwar Agriculture and Employment," described economic conditions likely to be associated with various levels of employment during the postwar years, and indicated probable effects of these different levels on farm output and on prices and incomes received by farmers.

The so-called "Hope Report," prepared by the Bureau of Agricultural Economics for the House of Representatives Committee on Agriculture in 1948, attempted to evaluate the economic position of agriculture some 15 to 25 years ahead, in the expectation that this period could be characterized by a relatively stable peace, increasing economic stability, and expanding foreign trade and investment. Other reports gave attention to special phases of the long-term prospects for American agriculture. Perhaps the most familiar of these is Dr. Sherman E. Johnson's *Changes in*

American Farming, published in 1949, which analyzed the prospective long-run changes in agricultural production, and discussed their implication for costs, returns, and production adjustments.

In all studies of this type the focus of attention has been on the impact of long-run economic and technological changes on agriculture. The policy implications have been in such terms as the types of national economic policies that would contribute to expanding and sustaining the demand for farm products, and those that would provide the maximum assistance to agriculture in making adjustments to prospective long-run changes in the demand for its products. The problem to which we address ourselves in this paper represents the other side of the coin. We are considering agriculture not as a relatively passive segment of the economy, which must adjust itself to the changes implicit in the general growth of the economy; but rather as an active segment, with casual relations also running from agriculture to the rest of the economy in terms of long-run growth.

This second approach poses a much more difficult analytic problem than the first, and the definitive analyses in this area are yet to be done. This, however, is true of the study of economic growth in general. It is a field that people are still trying to define with precision, and one that is characterized by tentative hypotheses, preliminary probings, and modest conclusions.[2]

III

In order to talk about the contributions that agricultural policies might make to general economic growth, it is necessary to have some notion of the factors which determine that growth. We will not attempt to provide a catalog of such factors ourselves, but we think that the *Economic Report of the President*, transmitted to the Congress in January 1954, furnishes some useful guides. Under the heading, "Conditions of Progress," eight major factors are listed. These are (1) individual freedom; (2) adequate economic incentives; (3) open markets and effective competition; (4) adequate savings and capital formation; (5) a growing fund of scientific and technical knowledge; (6) maintenance of economic stability; (7) a floor of security for the individual; and (8) extension and strengthening of economic ties with the rest of the world. It should be noted that these conditions do not appear automatically in our society, but call for positive government policy in every instance.

Each of us would doubtless want to make some amendments to the

[2] For a general discussion of the scope and content of the field, see Universities-National Bureau Committee on Economic Research, "Problems in the Study of Economic Growth," (mimeograph), National Bureau of Economic Research, New York, 1949. This report contains essays by Simon Kuznets, J. M. Clark, J. J. Spengler, and E. M. Hoover.

foregoing list, and we are inclined to add two further conditions frequently found in discussions of factors affecting economic growth, namely, the natural resources of the nation, and the health, education, and skill of its population. Assuming that this amended list does provide an acceptable starting point for the succeeding discussion, our next task is to classify agricultural policies in such a manner that their implications can be discussed in terms of the determinants of national economic growth.

In order to reduce our discussion to manageable proportions, it is necessary to consolidate a number of related policies under very broad headings. For the purposes of this paper, we will discuss four broad groups of agricultural policies: (1) increasing the efficiency of production and marketing; (2) stabilizing farm prices and incomes; (3) increasing domestic consumption of farm products; (4) improving the economic position of low-income farmers and other disadvantaged groups in agriculture.

IV

Under policies designed to increase efficiency, we are including a large number of things, most of which would be designated as separate policies in other contexts. We are including such broad policies as those having to do with soil conservation and agricultural credit; research that has given us better crops and livestock; improved machinery and farm practices; the application of production economics to the problems of most profitable organization of farm enterprises; research in the efficiency of processing and marketing; and the whole educational and extension effort that has gone into bringing the fruits of research in the physical and social sciences to the individual farmer.

It is in this area that the connection between agricultural policies and general economic growth is most obvious, and it is also the area where there is likely to be the largest degree of assent concerning a beneficial connection between the two. The long-time increase in agricultural production has provided the nation with abundant food supplies, which have been a material factor in the general health of the population.[3]

Furthermore, these supplies have been produced by a decreasing number of farmers, as a consequence of which there has been a steady release of high grade workers to the nonagricultural labor force. It should perhaps be noted here that, in addition to this release of workers due to increasing productivity, there has been a continued natural increase in the farm population, with large numbers of farm youth reaching working age moving directly into other occupations. During the period from 1940 to

[3] It has been estimated that from 1910-14 to 1947-50, there was a 77 percent increase in total U. S. food consumption. See Harold F. Breimyer, "Sources of Our Increasing Food Supply," *Journal of Farm Economics*, May 1954, pp. 228-242.

1950, the non-agricultural labor force rose by about 14 million people. Statistics suggest that over half of this was supplied by migration from the farm population. The productivity of agriculture has also provided the bulk of our export purchasing power during certain earlier periods, and has furnished great supplies of food for ourselves and our allies during two major wars and critical postwar periods.

Returning to our list of factors determining economic growth, it is apparent that these policies of encouraging efficient production and marketing are most closely related to the natural resources of the nation, the health, education, and skill of its population, and a growing fund of scientific and technical knowledge.

In terms of long-time economic growth, it would appear that we should continue those policies that enhance the productive efficiency of agriculture. It may well be, however, that changes in emphasis are desirable. Sherman Johnson, for example, has suggested that we should redirect our programs in the production area toward ways of achieving production balance and discovering ways of reducing costs without increasing output.[4] The objectives here would be to reduce pressure for immediate increases in output and to build up reserve capacity for expansion to take care of the gradual long-time growth of the market.

If we look ahead some 10 to 20 years, it seems quite evident that agriculture may well produce all we can sell in this country at satisfactory prices. But if we take an even longer look ahead, it may well be that the production job will turn out to be somewhat more difficult than for the immediate future. We may, therefore, be well advised to give increasingly greater emphasis to the protection of future resources.

We have said very little about improving the efficiency of the agricultural marketing system as such. This is because we believe that the contribution made to general economic growth by increases in efficiency are of the same character, whether they occur on the farm or in the distribution system. With continued increase in the outlays required by the marketing function, relative to returns to farmers, it is not surprising that the resources devoted to improving the efficiency of marketing have been expanded greatly in recent years. However, about four-fifths of the total research money of the USDA and the state agricultural experiment stations still goes to research that directly aids farm production.[5]

We recognize, of course, that part of the increase in the marketing portion of the national food bill is due to increased demands by consumers for improvements in processing and for more services in conjunction with

[4] See "Long-Term Price Outlook and Agriculture," "Discussion From the Standpoint of Farm Suppliers," *Journal of Farm Economics*, December 1954, pp. 799-801.
[5] See Ronald L. Mighell, *American Agriculture*, New York, 1955, p. 130.

the food itself. It is also true, however, that part of the increased marketing bill is due to various types of increases in costs not necessarily associated with product and service improvement. We believe that there are possibilities for real improvements in the efficiency of the marketing system. To the extent that they are realized, such improvements would not only aid agriculture, but would mean better final products at lower cost, a result that would contribute directly to long-run economic growth.

V

In contrast to the policies relating to efficiency in production and marketing, those in the second group—stabilizing farm prices and incomes—are more difficult to evaluate in relation to economic growth. They also represent an area of much greater disagreement. The maintenance of economic stability is now generally accepted as being one of the conditions of economic growth, and the responsibilities of government for maintaining this stability are also widely recognized. The Employment Act of 1946 specifically declares the federal government's responsibility "to promote maximum employment, production, and purchasing power." For this purpose, the federal government possesses powerful weapons. The *Economic Report of the President* referred to above, specifically mentions credit controls of the Federal Reserve System, debt management policies of the Treasury, flexibility in the administration of the federal budget, changes in the tax structure, public works, and agricultural supports.

Since the farm economy is characterized by marked instability of prices and incomes, which have often been low in relation to nonfarm prices and incomes, it hardly is surprising that there have been persistent efforts to stabilize and raise prices and incomes received by farmers. The discussion in this part of our paper is focused on the stability problem, rather than on the problem of desirable relationships between farm and nonfarm prices and incomes. Unfortunately, as we all know, price and income stability in agriculture is difficult to achieve, and even when it has been approximated, has often been accompanied by undesirable consequences, such as the excessive accumulation of surpluses and the necessity for controls on output. As a result of such difficulties, agricultural economists have engaged in continuous debates over such issues as rigid versus flexible supports, high versus stop-loss support levels, price supports versus direct payments to farmers, and the like. This paper is not the place to carry on that particular debate.

Our specific concern here is with the more general problem of the extent to which price and income stabilization programs for agriculture can contribute to the stability of the economy as a whole, and hence to general economic growth. Some economists apparently believe that agri-

culture is an almost completely passive sector of the economy, with hardly any chain of economic causation running from the level of farm output and income to the general level of economic activity. Those who hold this view tend to seek stability through general monetary or fiscal policies, or those that are directed toward maintaining business investment and labor income. They would argue that measures to promote agricultural stability can contribute little to general stability.

We disagree with this point of view. Rather, we agree with Nourse[6] that "the industrial sector of the economy can suffer unstabilizing jolts from a badly managed or incorrectly directed agriculture quite as truly as agriculture can be rocked by industrial disturbances." In our opinion, a sound agricultural policy can contribute substantially to general prosperity.

We know of no way to measure precisely how much agricultural programs could contribute to general prosperity. One approach is that of setting up an economic model, which appears to be reasonably realistic, and testing what would be expected to happen, with or without a support program. A noteworthy effort of this kind is a recent paper by Karl Fox.[7] Projecting a hypothetically severe recession, of two years' duration, Fox made quantitative estimates of the effect of the existing price support program on a number of economic magnitudes. He concluded that that program "might reduce the drift in the general retail price level by as much as 30 percent; it might reduce the decline in GNP and disposable personal income by something like 10 percent; and it would reduce the drop in farm prices (which it is specifically set up to do) by 50 percent relative to the level which would be expected in the absence of a price support program." This analysis is supplemented by similar estimates of the effects of alternative farm programs. Fox's analyses support the belief that price and income stability in agriculture would have stablizing effects on the rest of the economy, but at the same time, they indicate considerably more modest results in this direction than many agricultural economists have hopefully assumed. Fox's model is not designed to be more than a first approximation of the effects of farm price support programs on the economy, and, no doubt, he would agree that much more work needs to be done on models of this type before they can supply us with accurate quantitative predictions. But models of this type are a real step forward in helping us to understand the forces at work and kind of influences they exert.

---

[6] E. G. Nourse, "Agriculture in a Stabilized Economy," *Journal of Farm Economics*, February 1949, p. 202.

[7] Karl Fox, "The Contribution of Farm Price Support Programs to General Economic Stablility," Universities-National Bureau Committee for Economic Research, Mimeo., April 5, 1954.

Another way to study this problem is to review what has actually been done under the program. We shall not attempt a full review here, but will simply note a few facts about the program since the end of World War II. In this period there have been two minor (but general) recessions: in 1948-49 and in 1953-54. The farm price-support program was one of several factors that kept these recessions from becoming more severe. In both cases, the drop in farm prices preceded the dcline in general employment, production, and incomes. In both cases the crop-loan purchases programs slowed up the drop in farm prices and in farm purchasing power. The CCC investments in farm products increased 3.3 billion dollars from June 30, 1948 to June 30, 1950. They increased 4.4 billion dollars from June 30, 1951 to June 30, 1954.

Not only did these programs pump additional purchasing power into the economy during periods of slack, they also held down prices and incomes in periods of inflation. Thus, from June 30, 1950 to June 30, 1951, the CCC investments were reduced by 1.3 billion dollars. The liquidation of government stocks at this time was one of the most effective checks to swiftly rising prices.

Frankly, we are not able to measure how much these changes in farm-support programs affected nonagricultural employment, production, and incomes. But we think it is evident that major postwar changes in the program helped, rather than hindered, stability in the general economy. Of course, we are now left with a number of surpluses that are causing trouble. This may be due to a natural reluctance to reduce production and support levels promptly enough, rather than to any basic unsoundness in the concept of price supports.

Occasionally, we hear someone say that farm programs are inefficient measures for attaining general stability—that we should, instead, rely upon fiscal and monetary programs. But any program under which the government collects or spends money is a fiscal program in some degree. The price-support storage program is a fiscal program—just as the highway program is a fiscal program. Many fiscal programs can contribute to economic stability. Unlike monetary and credit measures, most government spending is discriminatory—affecting various segments of the economy differently. Specific fiscal programs in such fields as public works, unemployment benefits, and farm supports can, if wisely administered, attack specific areas of instability, which more general measures are incapable of doing.

This point of view is well expressed in a recent book by Maurice W. Lee,[8] who writes:

---

[8] Maurice W. Lee, *Economic Fluctuations*, Richard D. Irwin, Inc., Homewood, Ill., 1955, p. 508.

By means of appropriate adjustments in government expenditure and tax policies and through relaxations in general credit controls, the monetary and fiscal authorities may set in motion the forces necessary to prevent general deflation and yet still find that particular parts of the economy do not respond. Simple considerations of equity for the affected areas would suggest that this is not desirable, but even on grounds of the general public interest there must be grave concern about such a situation. For at various times in the past, as we have seen in our historical analysis of business cycle experience, the continued deflationary tendencies of single parts of the economy have ultimately generated forces which impelled the total economy on the same deflationary road.

The agriculture segment provides a case in point. It will be recalled that the general prosperity which followed World War I did not extend to the agricultural areas of the economy. There are numerous students who feel that the continued drag exerted by deflated purchasing power in the agricultural parts of the population produced distortions and strains in the economy which contributed materially to the severity of the Great Depression which followed."

The relation between agricultural stability and general economic stability is a very complex thing. Other relationships besides direct multiplier effects of farm income on total national income are involved. For example, in the preceding section, we stressed the contribution of increasing agricultural productivity to general economic growth. But there are also connections between agricultural incomes and productivity. Can anyone doubt that the great productive spurt that has taken place in agriculture during the last 15 years has had a direct connection with the favorable prices and incomes received by farmers during most of that period? For the first time in a very long period, farmers have enough liquid assets to enable them to make large purchases of farm equipment, fertilizers, insecticides, and the like. Here, it may be noted, there is a tie back to the growth determinant of adequate economic incentives.

We believe, then, that policies that promote the stability of agriculture do contribute to general stability and to general economic growth. Furthermore, this contribution does not have to be extremely large in order to be important. If we were to examine contributions to stability stemming from other individual elements such as social security payments, shifts in the tax structure, and the like, we would probably find that the contribution of each is a relatively modest one. Each element by itself may not be decisive, but taken together, they are.

We might add that there is not much likelihood that such efforts will be discontinued. As we witness continuing efforts to introduce stability into the incomes of nonfarm groups through such devices as expanded unemployment compensation, raising of minimum wages, and the guaranteed annual wage; it is difficult for us to envision any overwhelming grassroots demand for increased instability of farm prices and incomes. The demands for stable returns to agriculture will continue. And we believe

this demand is justified—not only as a means of helping farmers, but also as a means of contributing to general economic growth. It is incumbent upon us as agricultural economists to continue our efforts to develop and suggest policies that will not only reduce instability in agriculture, but which will also be truly conducive to national economic growth, and will be relatively free from undesirable side effects, such as undisposable surpluses, detailed restrictions on output, and checking the movement of excess agricultural workers into the nonagricultural labor force.

VI

Many governmental policies and programs affect the consumption of farm products.

Research in nutrition and related subjects has greatly affected the demands for food, clothing, tobacco, and other goods originating on the farm. It has doubtless benefited consumers fully as much as farmers. The general public has also benefited from such service programs as market news, grading and inspection. It has been protected by pure food laws and by various regulations designed to prevent price manipulation. To us it seems unfortunate that many people think of the Department of Agriculture as a Farmers' Department, watching out only for the special interests of the farmers, with little or no concern for the public interest. This has never been the case, and we hope it never will be the case.[9]

In the past year or so, increasing attention has been given to market development at home and abroad. Serious efforts are being made to find new markets, and to enlarge existing markets. We do not refer here to "give away programs" or to subsidies. Rather, we have in mind expanded efforts to meet consumer wants, needs, and preferences, based on wider research knowledge; and of the search for feasible ways to supply potential markets through private industry. Many agricultural economists have been rather skeptical of promotional and developmental programs. Yet large sums of money are being spent by the food trades for this purpose. Economists can do a real service by investigating possibilities of spending that money in ways that will not only be profitable to a particular group of farmers or dealers, but will expand the farmers' total market and raise the level of living of consumers.

Food subsidies have always been a controversial subject. We include here the school lunch and school milk programs, institutional feeding, direct distribution of food to low-income families through state welfare agencies, the former food stamp plan, and related programs through

[9] The 1954 Report of the Secretary of Agriculture quoted from President Lincoln's annual message to the Congress, "The agriculture department . . . is peculiarly the peoples' department in which they feel more directly concerned than any other."

which the government pays part of the cost of supplying food to some group of people.

We shall not take the space here to discuss these programs in detail. The controversies usually center about the question of how much attention should be given to nutrition, and how much to surplus disposal. These programs have always kept both objectives in mind—and we think that they always should do so. Actually, there is seldom any real conflict in the two objectives. When there is, we would give first attention to nutrition. But surplus dairy and poultry products, meats, fruits and vegetables would help the diets of most low-income people. When there are surpluses of these foods, both low-income families and farmers can benefit substantially from an effective program to help low-income families consume the surpluses.

We believe that the school lunch program should be expanded. We also believe that serious study should be given to possible improvements in the distribution of surplus foods through state welfare agencies. It might well be desirable to try out various forms of food stamp or food allotment programs, operated by private industry, and giving the recipient considerable freedom of choice as to what foods he buys.

Some experience along this line would be invaluable if we should in the future be confronted with another serious national depression with large-scale unemployment.

VII

In discussing policies to improve the economic position of low-income farmers and other disadvantaged groups in agriculture, we are actually considering policies for dealing with two different, although overlapping, problems. The first of these is the problem of rural poverty. The second is the problem of widespread deficiencies in the amount and quality of community services, such as highways, schools, libraries, and hospitals, available to farm families.

The problems of poverty are not limited to farmers nor to rural areas. There are too many people, including sick and aged, with inadequate incomes in all areas and all walks of life.

We defined economic progress so as to include an improvement in levels of living shared by all groups in our population. Much progress has been made along this line during the past generation. Not only has *per capita* real income risen substantially, but also this increase has been widely shared.[10] Yet we have a long way to go before poverty is eliminated, either in the cities or in rural areas.

[10] For an interesting analysis of the economic effects of redistribution of incomes, see M. Bronfenbrenner, T. Yamane and C. H. Lee, "A Study in Redistribution and Consumption," *Rev. of Econ. Statistics*, May 1955, p. 149.

The problem of rural poverty is a part of the problem of general poverty. It is still important. If we can reduce rural poverty, we will have made a real contribution to economic growth.

Agricultural economists and rural sociologists have long been aware of this problem. They have been interested in many attempts to deal with it. Such programs as rural electrification, credit to improve farming operations, training for nonfarm work, and rural hospitals have generally been received sympathetically. A recent development which may make an important contribution is the extension of the social security program to farmers and to farm workers.

Although programs of this type have helped to alleviate the low-income problem in agriculture, a concerted attack on rural poverty is still required. It is clear that much more needs to be done, and fortunately some of the best minds in our profession are dealing with these matters.

In the Joint Committee Hearings on the January 1955 *Economic Report of the President,* Dean Welch and Professor Nicholls gave extensive testimony on problems and policies relating to low-income farmers. Professor Schultz also emphasized this aspect of the farm problem in his testimony. In April of this year, the Department of Agriculture prepared a special report on problems of low-income farmers, entitled "Development of Agriculture's Human Resources." This was recently transmitted to Congress, accompanied by a message from the President.[11] The first paragraph of that message states the problem very succinctly:

> In this wealthiest of nations, where per capita income is the highest in the world, more than one-fourth of the families who live on American farms still have cash incomes of less than $1,000 a year. They neither share fully in our economic and social progress nor contribute as much as they would like and can contribute to the Nation's production of goods and services.[12]

The lines of action that have been proposed to handle this problem are numerous. Secretary of Agriculture Benson has offered a 15-point program, accompanying the President's message. In essence, the elements of the programs sponsored by many individuals and groups can be brought under two headings: (1) improving the earning capacity of those who remain in agriculture, where adequate resources and markets can be arranged; or (2) assisting low-income farmers, and farm youth reaching working age in excess of replacement needs, to find more profitable nonfarm employment, either on a full-time or part-time basis. These programs imply that, even under conditions of substantially full employment, with

---

[11] House Document No. 149, "Development of Agriculture's Human Resources," 84th Congress, 1st Session, 1955, contains a reprint of the report itself, the President's Message, and the Secretary of Agriculture's letter of submittal.

[12] These income estimates are for 1950, and do not include nonmoney income in the form of housing and home-produced food.

nonfarm opportunities increasing relative to those in agriculture, direct government action is necessary, to eliminate the existence of what the January 1954 *Economic Report of the President* describes as "pockets of rural poverty."

We do not think it is necessary to argue very much about the need for a substantial continuing program to aid low-income farmers or to demonstrate a connection between the elimination of rural poverty and general economic growth. If we can maintain a high and stable level of national employment, the operation of the competitive price system will help to bring about the movement of many low-income farmers into more remunerative occupations. But we should recognize that there are limits to what the competitive price system can accomplish, even under conditions of substantially full employment. Despite its great effectiveness in ordering economic affairs, there still remain areas of chronic maladjustment, where direct action is needed to restore the productive power of both natural and human resources. Many of the low-income farm areas are definitely in this category. Until they cease to be such, agriculture will not be making its maximum contribution to the economic growth of the country.

Although our main interest is in the levels of living of low-income farmers, we must not forget that all rural families—regardless of income—have ordinarily suffered certain disadvantages. The automobile and the radio have greatly reduced their disadvantages in the field of communications. Still rural families in general are not as well off as urban families with respect to roads, schools, and schooling, libraries, and medical care.

Part of our efforts to promote general economic growth should be toward reducing the disparities between rural and urban levels of living. Many economists have spoken about "balanced" economic growth. Balance in economics is difficult to define. We can sometimes point out *imbalances.* Inventories may be high in relation to orders. We may have a surplus of beans and a shortage of potatoes. Such imbalances are to be deplored. Likewise, it is deplorable when, and if, there are too great disparities between rural and urban levels of living.

It is, of course, difficult to define the proper balance between farm and city levels of living—just as it is hard to get a workable definition of "income parity" for farmers. We recognize, for example, the difficulty of making accurate and fair comparisons between *per capita* farm income and *per capita* nonfarm income. But we are suggesting that some undesirable disparities still exist, and that a reduction in such disparities would assist general economic growth. It is especially clear that there are many low-income families on farms and in rural areas. Many of these families do not benefit much from price support operations, and special programs are needed to help them.

VIII

Our discussion has been centered on the contributions that agricultural policies can make to the economic growth of the nation. We think these contributions have been substantial and can probably be even greater in the future.

We are not arguing that agricultural programs are the only, nor even the principal means of promoting economic growth. We need an integrated set of economic policies in a number of fields, including money, credit, taxation, international trade, wages, social security, and the like. Our agricultural policies need to be geared in with these others as part of a concerted effort to promote economic growth and stability. They should be designed, not only to help the farmers, but to help all citizens obtain the levels of living that are inherent in our great economic resources.

To do this, the agricultural economist needs to work closely with the general economist, and with economists specializing in such fields as labor, industry, and finance. Within the federal government, this cooperation has been facilitated by the Council of Economic Advisers and by the Joint Committee on the Economic Report.

DISCUSSION: CONDITIONS AND RATES OF ECONOMIC GROWTH

WILLIAM H. NICHOLLS
Vanderbilt University

We are indebted to Professor Ellis for his comprehensive and thoughtful quest for a theory of economic growth in our professional literature. He would probably agree with me that the "net yield" of his survey is small indeed. Nevertheless, I believe that he has correctly delineated the major areas which, in combination, promise ultimately to provide more satisfactory general principles of economic development and better guides to public policy in this important field.

Professor Ellis finds a great paucity of contributions to the literature in his fifth category, "pure theory." Here he places primarily theories of Keynesian lineage, which I agree are of little value to underdeveloped countries. In fact, I would assert that, in training foreign students, our courses in Keynesian economics have done much to strengthen our tendency to send back "overdeveloped" economists to underdeveloped countries. I particularly like Professor Ellis' emphasis upon the importance of economic history as a means of developing more satisfactory theories of economic growth. Indeed, I think that we have much to gain from research in economic history which uses Professor Ellis' other two categories, statistical analysis and comparative statics, as major tools.

One of the most interesting by-products of the recent burgeoning of interest in economic development has been a revival of the sadly neglected field of economic history. Whether by default or otherwise, economic history has in-

creasingly become the province of professional historians who know little economics and less statistics and who lack any central thesis that can give their chronicle of events real meaning. In my opinion, there is a vital need for more well-trained economists to turn their attention to matters of economic history, with the process of economic development as their major interest. Such history-with-a-purpose would seek to identify and focus attention upon the "prime movers" in past economic development; to compare the results where these "prime movers" have been strong and weak; and to emphasize those types of private and public policy and institutional change that have facilitated or hindered the developmental process.

In such an endeavor, Professor Ellis' four primary "moving causes" are highly suggestive, although they indicate the breadth of interest and training that investigations of this kind demand of the research worker or research team. The central importance of innovation—whether original and indigenous or borrowed from elsewhere, whether activated by private enterprise or by public agencies—requires not only a knowledge of economic and social institutions but of technology and physical sciences as well. Analysis of the cultural factors favorable to innovation and change is of vital importance, but requires social scientists in the broadest sense of the word. A study of the little-understood relations of population increase to economic development necessitates that, after a century outside of the economics fold, population analysis must again become a major concern of economists.

Only Professor Ellis' fourth "moving cause" of economic development, "balanced growth," falls within the generally accepted scope of modern economics. By "balanced growth" he means "the correct allocation of factors"—long considered the central core of economics. For anyone with experience in underdeveloped countries, the crucial importance of this "prime mover" in a cumulative and dynamic process of economic growth cannot be doubted. This principle of "balanced growth" must be applied to such difficult practical investment-allocation problems as agriculture vs. industry, the commercial vs. the subsistence sector of agriculture, light vs. heavy industry, production goods vs. education and public health, and the capital city vs. the hinterland. Despite its conceptual superiority to static marginal analysis, linear programming does not appear to me practically useful in most underdeveloped countries, where the requisite statistics normally are inadequate or nonexistent. Under these circumstances, the practical application of the concept of "balanced growth" must of necessity rest upon personal judgments that are subject to substantial error. Even so, the usual political decisions are likely to produce even grosser errors of public policy—such as the neglect of agriculture (or at least of its great subsistence sector), lack of attention to capital investment in human beings, undue emphasis upon the development of heavy industry and the capital city, and primary dependence upon inflationary stimuli. The consequences are apt to be an abortive economic development, characterized by the erection of small islands of privilege in a continuing sea of poverty.

On the other hand, in a world of immigration and trade barriers and of very limited international capital flows (largely in the wrong directions), I believe that the conception of "balanced growth" must be largely applied on a national rather than an international basis. I recently heard an economist who—accepting Colin Clark's prediction that primary goods will enjoy increasingly good terms of trade *vis-a-vis* manufactured goods—advised underdeveloped countries to

concentrate their attention upon the development of exportable raw materials. I object to such advice on two grounds. First, I believe Clark's prediction is wrong. Second, quite apart from possible world business fluctuations, I believe that the demonstrated ability of the industrialized countries to develop synthetics and substitutes makes continued heavy specialization of a national economy on a few raw materials even more hazardous than ever before. Even for our own underdeveloped Southeast, which has the great advantage of being an integral part of a dynamic and advanced national economy, I would reject such advice.

In this connection, I would particularly emphasize my belief that "balanced growth" has an important geographical dimension. That is, beyond some point, the further concentration of economic development in particular parts of a nation should be avoided in favor of greater geographical dispersion of the benefits of economic growth. To the extent that regional differences in per-capita real income arise and persist within a nation, imperfections in the functioning of the capital, labor, and product markets are likely to be at the core of the difficulty, calling for public policies to facilitate the economic adjustments necessary to level up incomes in the less developed regions. Here again, as we are finding in our studies of Southern conomic development at Vanderbilt University, comparative historical research on the economies of areas in different stages of development can teach us much about the origins of (and barriers to) economic growth and the nature of the process by which it takes place.

Although our own researches are still in the early stages, I am already convinced that migration of surplus agricultural population from an underdeveloped region, while ameliorating the situation, is unlikely to be on a sufficient scale by itself to eliminate regional income differentials. Industrial-urban development of the low-income region is also necessary for two reasons. First, it attracts many additional low-productivity people out of agriculture who would not change occupations if long-distance migration were necessary. Second, it usually brings with it an influx of outside capital, which helps promote further general economic development and provides the local markets and financial resources needed to assist the nearby agriculture to reorganize on a higher-productivity, higher-income basis. For a nation such as ours, Professor Ellis finds in population increase a stimulant to growth both in terms of demand and (through in-migration) in terms of new ideas. However, the reverse process should not be lost sight of—that is, the unfavorable socio-economic effects of the loss of human resources in their most productive years and the drain of social capital in a region characterized by persistent, large-scale migration. For these reasons, I believe that an inflow of capital is essential to complement the outflow of people in an underdeveloped region and that sound industrial-urban development is the major dynamic factor in accomplishing this result.

In concluding this regional application of Professor Ellis' analysis, I should like to endorse his statement that "production, provided it follows the directions of relative demand, does create its own vent . . . and rests upon the basic economic motive to produce, consume, and possess more." In my opinion, political opposition to Southern industrialization on grounds of its interregional competitive aspects is shortsighted and fails to consider the broadening markets that such a process will inevitably create for all parts of our nation by raising Southern incomes. Anthropologists may object to Ellis' attribution of such a dominant *economic* motivation to the people of underdeveloped areas. Yet I

believe that, with our fantastic improvements in communication, economic motivation is becoming much more significant throughout the world. Failure to recognize this fact is too often used as a mere excuse for avoiding assistance to low-income peoples. Even in this country of economic men *par excellence*, how often do we hear it said that low-income Southern farmers prefer to "hunt and fish" anyway? I feel that such comments are grossly unfair so long as such people lack any remunerative alternatives to leisure, as is so often the case. I believe that experience has already shown that, *given alternatives*, most low-income rural people eagerly choose economic activity over leisure. Furthermore, given the greater local availability of consumer goods, the increased purchasing power required to buy them, and the hastened pace of competition in consumption levels, the magnitude and pattern of wants can and does increase rapidly in a low-income community. If we recognize that wants are not static, the much-deprecated presence of television aerials on rural shacks takes on new significance and promise. With such modern and effective forms of communication, even the most remote low-income families (particularly the children) can hardly remain immune to economic motivation.

At the present stage, I feel that we should not be discouraged by the unsatisfactory state of economic growth theory or by the breadth of competence in different disciplines required if our researches are to be fruitful and our ultimate generalizations of practical value. The important thing is that economists have come generally to recognize economic growth as a highly significant problem. Empirical and theoretical investigations of economic growth and development are now under way on a broad front. I have enough confidence in our profession and related fields to believe that, during the next decade, better and wiser answers about the principles and policies of economic growth are sure to emerge.

DISCUSSION: CONTRIBUTIONS OF AGRICULTURAL POLICIES TO GENERAL ECONOMIC GROWTH

O. B. JESNESS
University of Minnesota

There is little with which to quarrel in the general philosophy expressed by Waugh and Cavin in their paper. Agriculture is an important segment of the economy, so anything that contributes to agricultural well being, unless at inordinate cost to the rest, contributes to the welfare of the economy as a whole. There is nothing unique in this because the same may be said with respect to every other segment of the economy. Rather than to use his limited time to extol the virtues of the paper, the reviewer aims to direct attention to some questions it leaves unanswered or to some doubts arising either from its commissions or omissions.

The authors being in government service with their headquarters in Washington naturally point with pride to the contributions of agricultural economists who depend on the federal payroll for their sustenance. The reviewer yields to the temptation to suggest that the District of Columbia possesses no monopoly on either good economists or good deeds.

Why the authors thought it necessary to emphasize the extremes in attitudes before a group of their professional colleagues is not clear. Agricultural econo-

mists certainly do not fit into either the category of "agricultural fundamentalists" or of those who assign no role at all to agriculture in the general economic picture. The authors have plenty of company in the in-between place they assume.

No reason is found for believing that there is anything but extensive agreement on the eight "conditions of progress" outlined in the Economic Report of the President for 1954. After having cited these, however, the authors apparently saw no need to use them as a backdrop against which to test some of the operations of current farm programs.

Sherman Johnson's suggestion regarding redirecting our research towards "discovering ways of reducing costs without increasing output" is referred to approvingly. Application of such findings may have considerable farmer appeal during depression conditions. However, the authors apparently did not think it important to note that programs of price supports at attractive levels work in the opposite direction by providing incentives for employing practices that increase output.

Waugh and Cavin make use of the popular contention that farm prices and incomes compare unfavorably with their nonfarm counterparts. Incidental mention is made of the ineffectiveness of price supports in reaching low-income people on the land but there is no suggestion that the authors see any inadequacies in over-all averages as guides to farm price programs. The politician or the special pleader may find these averages and comparisons useful to bolster his arguments. The professional economists, however, will do well to remind themselves and the persons they address, of the inadequacies of such averages. This is particularly important because of the frequency with which the average income of all farm people is used to bolster the argument for programs to increase the incomes of commercial farmers for whom the figure is not representative.

The authors will find agreement with their contention that price-support operations in the late 1940's may have aided in keeping the slump from becoming worse and that the resulting storage accumulations tempered inflation in 1950 and 1951. However, it is not pointed out that had not the "Korean incident" bailed us out at that time, the uncomfortable supply situation we now are in would have come that much earlier. They recognize that "we are now left with a number of surpluses that are causing trouble." Is this adequate treatment of a "$64 question" so pertinent to a review of the contributions of farm policy to economic growth and stability? It is to be hoped that the seeming diffidence of the authors in examining such matters is not an indication that objective research and freedom to take a position cannot be expected in a department that has responsibility for the action program.

The paper suggests that "any program under which the government collects or spends money is a fiscal program in some degree." This, of course, is a truism. The further observation is made that "many fiscal programs contribute to economic stability." However, the authors surely do not mean to imply that a fiscal policy designed to contribute most effectively to economic stability will result from uncoordinated collection and spending. Programs of expenditure that, like the Mississippi, "keep rollin' along" in inflation and deflation may aid constructive fiscal policy at some times, but hinder at others. A marked tendency to drag our feet in adjusting farm support programs downward to fit changing conditions is worth noting in this connection.

The reviewer does not take issue with the contention that the favorable farm income situation after 1940 was a significant factor in the rapid gain in productivity. Attention, however, is called to the fact that War II and Korea, rather than the farm price program, were mainly responsible for the relatively favorable farm income situation.

The authors' position appears somewhat vague on certain points. Are we to conclude that a given support program is to be continued because it is difficult "to envision any overwhelming grass-roots demands for increased instability of farm prices and incomes"? Is calling attention to needed changes in a farm program to be construed as a plea for "increased instability"? This suggests a *reductio ad absurdum*. Protective tariffs contribute to stability (of those protected). Protectionists are not pleading for instability so there must be no (downward) change in import restrictions.

Certainly there will be wide agreement on the call to agricultural economists "to develop and suggest policies that will not only reduce instability in agriculture, but which also will be truly conducive to national economic growth, and will be relatively free from undesirable side effects, such as undisposable surpluses, detailed restrictions on output, and checking the movement of excess agricultural workers into the nonagricultural labor force." Perhaps this is the authors' way of calling attention to the fact that some features of present programs fall short of meeting these specifications. If so, would it not have been more effective if this had been done directly?

The authors may well say in their defense that they were not asked for an appraisal of good and bad features of current programs. That point is well taken. However, if by implication these programs are viewed as stabilizers, is there not an obligation to point out contrary effects? How else can we make such programs more effective as stabilizers?

Before we accept recent price support activities as economic stabilizers, do we not need to take a careful look at consequences that may impede economic growth and have some unstabilizing effects? The present accumulation of storage stocks creates knotty problems of disposal without upsetting markets. It also raises some serious questions regarding effective resource use. Are we not continuing to provide incentives to add to these surpluses? How well are marketing quotas serving the ends of good resource use and economic growth? How long can we continue without curbs on the use of diverted acres? Without such curbs, are we distorting other parts of agriculture? Will, for example, our shift of acres from wheat to feed grains spread the surplus problem to livestock and livestock products? Will this contribute to economic stability and growth? The authors do well to emphasize that farmers are plagued by instability. Let us avoid adding to these instabilities in programs that are intended to be of service to farmers and to the economy as a whole.

Nutrition is a field of special interest to Dr. Waugh and the reviewer finds himself in agreement with this section of the paper. It might be suggested that the skeptical attitude of many agricultural economists relative to programs to promote consumption may be a response to the exuberance of some disciples of advertising who seem to think that the lack of stretch in the human stomach is a myth rather than a physical reality.

Likewise there is no dispute over the point that realistic attention to the problems of low-income people on the land can contribute not only to their welfare but also to the general welfare and economic growth.

ECONOMIC IMPLICATIONS OF FARM AND HOME PLANNING WORK

Chairman: E. P. Callahan, Extension Service, USDA

THE ROLE OF AN AGRICULTURAL ECONOMIST IN A FARM AND HOME DEVELOPMENT PROGRAM—FROM AN ADMINISTRATOR'S VIEWPOINT

E. J. Nesius
University of Kentucky

A QUOTATION by a Kentucky county agent should be enough to challenge and inspire any dedicated agricultural economist to consider the problems of farm and home development.

> I want to say that I am completely sold on this idea of farm and home development.The reason I am sold on some type of program is that up to this time we have never really tackled the vital problems of the farm family and faced their problems with an actual project. A few older county agents have counseled with individual farmers along this line, but it has not been a project of the College. It is one thing to set up a tobacco demonstration or refinish a piece of furniture, but a totally different thing to face the actual economic problems that a farm family faces. So, it is the most important program we can do. Instead of pushing a pasture program, we need to look at it through the eye of the farmer and say "where does pasture fit into my farming program"? From then on, we are on sound ground.

This is the kind of music farm management workers yearn to hear. In spite of the opportunity that farm and home development offers for teaching farm families, there are many agriculturists who misunderstand the method, its scope, and objectives.

Farm and home development is interpreted here to have the same meaning as farm and home planning.

Farm and home planning emphasized on a national scale reflects the concern of federal and state extension leaders that before many years the increasing demand for agricultural production may become a problem of increasing importance to the nation. Agriculture and home economics extension is an off-campus educational arm of land-grant colleges and the U. S. Department of Agriculture. The need, it is believed, is for intelligent interpretation by farm families of farming and homemaking technological facts. In addition to bringing new technology into use, there is need for guidance through the changes resulting from adaption of technological facts so that farms are kept efficient and consumption is such that families realize maximum satisfaction.

In farm and home planning it is obvious that many leaves have been taken from the books teaching farm and home management, so the re-

sponsibility for making a success of the venture rests heavily upon the respective shoulders of the scientists concerned with said subject matter. Unfortunately, the activity is too dependent upon methods, e.g. farm budgeting, developed primarily to perform research studies.

Farm and home development is a better organized and more intensified method on the part of the extension service to teach coordinated subject matter and the principles of planning and management. It is an intensive effort directed at careful counseling of a limited number of farm families with the idea of extending the benefit to many others by demonstrating the value of planning and management and the use of the most modern, but tested, methods of farming and homemaking. It may be applied generally to many farm families by teaching only the fundamentals of planning and related subject matter, but without guiding the family through the mechanics of making its own farm and home plan.

The core of the method is problem solving. Families are taught facts, encouraged to analyze their situation, recognize their opportunities, determine a course of action, and proceed by using the best means to attain their chosen goals. Through it the family gets experience in seeking sources of information for more intelligent decision making.

Farm and home development is unique in that (a) it emphasizes a systematic planning approach for integrating farm production and home consumption (b) it is concerned with the family, and (c) it is a problem approach (functional) as contrasted with a segment approach. The farm family is the object of the activity and the purpose is realization by the family of greater satisfaction through more intelligent use of technology and resources.

It is the only extension activity that begins with an expression of needs and wants (felt needs) by the family. It is the first real opportunity for coordinating technical information in such a way that families may take into account the relative importance of alternative courses of action. This is significant because for each family the relative values and priorities that are established from the same information form very different patterns of preferred choices. Finally, it is the first opportunity in a broad sense that extension has had to unite the concepts of family goals with the concepts of planning. Linking these two concepts to the concepts of problem solving in a framework separate from any particular subject matter provides a new possibility for extension endeavor. I shall point out later that this is one of the most important features of farm and home development; yet we are severely handicapped for lack of information and assistance in these combined areas.

Some confusion exists among administrators about farm and home planning. Most of this confusion can be traced to frustrations (a) in the

adequacy of information (b) in the difficulty in training of extension personnel, and (c) in difficulty in separation of means from ends.

Adequacy of Information

Available information in some important areas is insufficient and inadequate for farm families to base important decisions of future impact. Refined and flexible data of inputs and outputs, probabilities of future events and prices, and knowledge of the best methods to assist a farm family in its periods of economic and sociological transition are some of the basic types of information needed. Oftentimes, when the available information is tailored to fit the individual family, the inconsistencies are exposed, which tends to undermine confidence in the details of planning.

The activity itself is difficult to define so that a farm family clearly understands what is involved. Gross generalities of more satisfying life, more gracious living, better home life, and freedom from drudergy are all worthy objectives to parade before the farm families; yet when the county extension agent tries to explain just how all of this is to come about, the family is often left in a vacuum in its quest for tangible handles for justifying their participation in the activity. This is because the extension agent doesn't have enough knowledge about the scale of preferences for the particular family so it can realize all these presumed advantages toward better living. Oftentimes, the family goes along because of its faith or confidence in the extension agent rather than because of a clear perception that the benefits to them will more than exceed the costs of worry and effort.

Difficulty in Training

Persons who can give training and direction to other extension personnel are scarce. Extension workers need more training in relating the broad subject matter areas. Although an inadequacy of information exists in some areas, there is much information that has evolved from the research of the past five years that has not, to my knowledge, been transformed into extension methods of teaching. Probably the greatest drawback at this time is failure of most workers (including many farm management workers) to understand the basic underlying concepts of modern economics. Marginal productivities, discounting, probabilities, and indifference maps and many other similar concepts need, somehow, to be interpreted so that they can be taught to minds unaccustomed to thinking in such terms. When this is done the important principles of decision making, the use of background information under variable conditions and other modern technological information will be much more useful to farm and home planning.

Means and Ends

In the broad expanse between the goal of a college education for the children and the right protein to feed the cows, a frustration exists between what are means and what are ends. Ends can be established at all levels, as can means. Ends in one instance become means to a larger and more important outcome. The organization of our framework gets fuzzy and we get lost when subjected to particular cases. Although agricultural economists may not feel responsible in this area, there is work to be done to bring clarification so that we can be more effective in our teaching of farm families; and we must not overlook the fact that administrators are willing to discount or dismiss much criticism. They expect it when changes are introduced.

There is effort on the part of some agricultural economists to formulate an economic framework within which farm and home planning could be explained and developed. The writer is best acquainted with the concepts developed by E. O. Heady with regard to farm and home planning and believes that framework so far developed holds much promise when finally interpreted in procedures useable in teaching farm families to accomplish the specific tasks necessary. Further, the work being done by the North Central Farm Management Committee on "decision making" is valuable and provides basic information for farm and home planning.

Economics is a science of choice and decision making. Planning is a process in which an attempt is made to evaluate means and ends and to establish some of the most probable future relationships of the means to each other at different levels of satisfaction. Goals (ends) are chosen to be attained; when these are evaluated against each other for relative importance at progressive levels, control over resources, choices and decisions are made. The basis of choice will not always be economic in nature; however, the framework within the choices made must first have been balanced against economic factors.

In summary farm and home planning as a teaching technique provides opportunity in three areas important for furthering economic progress among rural families:

1. Opportunity to teach families problem-solving techniques[1] as a method of making optimum use of technical information in agriculture.
2. Opportunity to teach families basic principles of individual planning to reach specified goals (ends).
3. Opportunity to approach the problems of production and consumption together and separately as needed.

[1] For an extension program the term "problem solving" may be difficult to use. Perhaps "opportunity evaluation" is better.

Opportunity to Teach Families Problem Solving Techniques as a Method of Making Optimum Use of Technical Information in Agriculture

Problem solving in more formal terms is derived from scientific method. It is a systematic procedure for handling concepts and facts. These concepts and facts are important for making decisions. Problem solving and decision making have many of the same features. However, implied in decision making is greater emphasis on strategy and the personal factors of man such as his "drives" that determine and motivate action. Problem solving, on the other hand, is conceived as more detached from the individual psychological aspects of decison making and more objective treatment can be given a problem for evaluation.

Any family that has gone through the steps of making a farm and home plan has knowledge of the problem solving technique, as the procedure follows the logical steps of the problem, evaluation, information and most likely solution. Extension has not developed a universally satisfactory method of using this procedure except through farm and home planning. A discussion of needs for better problem solving follows:

1. Precise methodology and forms need to be developed that can be used effectively and understood easily. One proposed way is to have specialists list the most-asked-about problems and then set up a logical questioning procedure for each problem. Such questions would lead the family to consider the important aspects of the problem and point the way for sources of information.
2. Problems faced by farm families need classification so that extension workers can use a best approach in their own plans of work in assisting families with their problems. One method of classification is to recognize different levels. The *first* level may be that which includes the overall actions of family life. Such would include the broad areas that are the numerators of this equation for what we call family satisfaction; for example, attaining a good education for the children. At the *second* level would be included one or more phases in attaining the first level problem; for example, earning sufficient income from the whole farm. At the *third* level problems would include only one segment of the second level such as attaining maximum efficiency in the tobacco enterprise. At the *fourth* level problems would include one element of the third level problem such as proper fertilization of tobacco. The concept here is one of conceiving the overall umbrella of life and then following down a channel to the minutia. Each level can be subdivided into more channels. One can quickly see that problem-solving from an extension agent's or the family's point of view would be significantly different at each level. For example, the degree of responsibility and the

division of labor as among the various members of the family differs at each level. At the first two levels the whole family is involved. At the third and fourth levels the problems are mostly for those in the family responsible for that aspect of the family business. There is a wide range of problems at each level.

The number of alternatives varies greatly at each level and usually decreases at each successive lower level. The number is usually least at the fourth level. In fact, the only alternatives, if certain prescribed recommendations are used, are whether to use them or not.

The problem of extension is to know what the problems are at these levels and then pattern an extension program that teaches families to do their own evaluation. Extension needs help in classifying and understanding these basic areas.

Opportunity to Teach Families Basic Principles of Individual Planning To Reach Specified Goals (Ends)

Planning is also problem solving, but as a concept encompasses a different category of problems. Planning at the individual level has been confused by association with the procedures developed over the past 25 years for farm and home budgeting. To have meaning as a concept, planning should be separated from subject matter and evaluated in its own context to develop a framework that can be applied to any problem situation. Thinking so far by some indicates planning has three dimensions. Namely, *vertical unit planning* which implies different levels of planning; *horizontal planning* which means at any level a range of situations and, *time planning* which projects action to or near some future date. Any particular plan to be a worthwhile plan must answer the questions, (a) what is to be done, (b) how much is to be done, (c) how will it be accomplished, and (d) when will it be accomplished.

So far the planning in farm and home development has been closely associated with prices, quantities, costs rather than with the theory and concepts reflected in the specific forms or procedures chosen to use the data. These forms and procedures suggest that good planning can be done only when properly filled out. Actually they were developed as research tools. They are laborious and restrict farm families in evaluating their opportunities. Perhaps they are the best we can produce. Any budgeting system that reflects fixed relationships and single-value expectations will have limited use as an extension tool. Perhaps if we had the whole area of problem solving classified and understood, more appropriate forms and procedures would be developed.

Worthwhile planning cannot be done without goals, which may reflect the preferences for particular wants and needs. If we knew more about

how the preferences for particular wants and needs change when exposed over a range of different situations, such as various degrees of economic status, different phases in the family cycle, status in the community, etc., we could better design educational programs that more nearly serve the family. We hope someone will plot the preferences of the part-time employed family, the tenant family, the family on a low-production farm, the young family, or the family ready for retirement in the various degrees of adequacy in the above situations.

To complicate the situation further, if we take any of the above conditions and get the wide range of preferred choices for each family due to variations in education, background, participation in the community and a multitude of other casual factors, we find our ignorance in many ways greatly exceeds our knowledge.

If one wishes to test his knowledge of planning procedures and concepts, let him try to assist a family to develop a plan when they are in a complete state of uncertainty relative to tenure. Take, for example, a share cropper family that must make its plan and be ready to move to another landlord next year. This family is forced to plan in some manner. What do we know about drawing up workable farm and home plans under such conditions? For contrast, let him think through the problem of the land owner well established in the community with all debts paid and with a well-developed and profitable livestock system. How are the concepts of planning different in the two instances? When a researcher states in his analysis that family preferences are given and outside the frame of reference, dependent upon the nature of his study, he may also be saying that his conclusions are made in a vacuum.

Planning is frequently done for this year and for the long run without reference to the steps between now and then. The importance of such steps cannot be overemphasized. The real test of a good farm and home plan is the manner in which it will be accomplished. Especially is the manner of accomplishment significant if the gap between the present and the possible is very great.

Farm economists have taken the lead in developing the framework to the present. They need to take the present information and build upon it. We need help!

Opportunity to Approach the Problem of Production and Consumption Separately and Together as Needed

It is patent among agriculturists to believe that planning begins with the land and our objective is to maximize the output of land when prices and costs are given and production response known. When applied to a family plan, such an approach is unrealistic. The implied assumption is

that the family consumption pattern must be scaled to the potential of the land resources. More realistic planning would begin with the preferences of the individual family and then within the reasonable range see if the resources will provide the family its wants and needs. Beginning this way, the land becomes only one of a number of resources at the disposal of the family. The most frequently accepted sequence in planning of the farm layout, the rotation and the best fitting livestock system appears from this angle as a rigidity that we attempt to impose upon our rural friends and which, in the final analysis, may restrict their economic development.

When a family begins the planning process by establishing goals and then develops a preferred plane of living, it is frequently true that in trying to set up an economical production plan to meet the wants and needs, a family proves that its opportunity is so limited that other means must be found.

There is much to be developed in our knowledge about farm and home planning within the area of production and consumption interdependency.

It is the hope that the ideas in this paper will cause those concerned with concepts of farm and home planning to give careful consideration to the problems faced by extension workers. In the preparation of this paper it would have been easier to have enumerated the gaps in subject matter content and to have composed some problem statements for research. There is much more needed on the subject matter side of the problem of farm and home planning but at the present I believe the problems explained in this paper are of greater magnitude.

ORGANIZING ECONOMIC RESEARCH SPECIFICALLY FOR USE IN A FARM AND HOME DEVELOPMENT PROGRAM

SYDNEY D. STANIFORTH AND LEE M. DAY*
University of Wisconsin

THE kind of economic research we do in support of the farm and home development program is dictated by the nature and purposes of this program. It is not our assignment or intent to dwell on a definition of nature and purposes of the farm and home development program but to briefly review the subject to decide what kind of economic research we do for use in the program.

First of all, it is basically a training program. It's purpose is to train farmers, or farm families, how to plan and execute the development of the farm and the home as an integral unit, even though the two are in some ways competitive. The purpose of this program, and the job of the people engaged in it, is not to work out plans for the progressive development of the farm and home for the family. The purpose is to help them learn how to do that job for themselves. The end product of a successful farm and home development program is a farm family that is better able to use the technical and economic information we can offer them. This means that economic research designed for use in this program must be of a nature and in a form such that the individual farmer can use it in making decisions for more effective development.

Whether the program is directed exclusively at beginning farmers or is broad enough to include all those who are interested, it is dealing with the problem of training farmers to build, expand or otherwise develop their farms. Economic research organized for use in the farm and home development program, then, must yield information directly useful in development rather than defining an optimum or ideal that might be considered the end goal of development.

The optimum or goal is not even appropriately the starting place. Operationally the program is not a process of establishing goals and then proceeding to break the gap between the current situation and these goals into year by year steps than can be achieved in progression through the years by the farm family. Such a concept of the program fails to recognize that both the goals and the ability to achieve these steps will change constantly, especially as progress is made in development. A more serious danger of this approach, however, is in reverting to a program in which the end product is developing a written plan for the farmer describing progression of steps that soon becomes obsolete, leaving the

* The comments, suggestions and ideas of Glen Pulver and Peter Dorner have been very helpful in the development of this paper.

farmer with no usable plans and no better training to develop his own as he goes along.

A more constructive approach is to train the farmer to analyze his present operation; to identify the weaknesses, and to plan investments and adjustments so as to take advantage of the most productive opportunities. In this way he continually works toward his own personal concept of optimum without having necessarily explicitly formalized it and constantly modified it. In this approach the emphasis is on research that will provide technical coefficients and prediction results of alternative actions, rather than on unit requirements type of data that would be required in the approach of defining a goal and then laying out the progression of steps to reach that goal.

Research designed specifically for use in a farm and home development program is not, in the normal sense of the term, equilibrium analysis. The choice of what to do is not made in terms of whether or not it will pay, but in terms of what will pay the most. The basic economic principle guiding decisions is to get the maximum rate of net return per dollar spent or invested (with capital restricted) rather then achieving a marginal cost-marginal revenue equilibrium. This basic principle is essentially the same as recognizing opportunity costs or, in the elementary case, equating marginal revenue in all alternative opportunities.

What Can We Work On?

Naturally, the specific problems selected for economic research will depend greatly on the conditions actually existing on farms. In approaching a common problem of development, however, some generalizations can be made. Development is primarily a capital accumulation problem. Capital is a seriously limiting or strategic factor. The process of growth and expansion of the farm business usually consists of plowing the returns from limited investment funds back into further investments to accumulate a stock of working capital. This means that a high priority falls on research that furthers our information on investments, and that combines both a high rate of return and an early realization of that return. We are looking for immediate *income generators.*

The problem of underdevelopment as we find it in agriculture today is basically one of inadequate volume of production rather than one of high cost. Admittedly unit cost of production is high, but most of these farms would still not be able to achieve an acceptable income and standard of living even if their total gross income were realized as net income. Development, in most cases, then, means expansion to achieve the twofold benefit of higher volume of production and lower cost which is made possible (but, of course, is not automatic). This may seem like a rather

fine point of definition and quite academic in nature but it has significant meaning in selecting research problems. It rules out a major part of research aimed at cost reduction by further mechanization at the present time, as far as underdeveloped farms are concerned. Although mechanization, of dairy production for example, is a very important part of more efficient production, it is not one of the big initial income generators. It will play a big role as growth and expansion are achieved.

How far should we go in research to develop methods and techniques that will bring the efficiency of mechanization to the smaller farmer? We have faced this question frequently and my judgment has been that this is not a very fruitful area. In most cases the technique loses much of its efficiency in adapting it to small scale, even with the careful design of special machinery and equipment. And to the extent that any such adaptations are successful they can seriously retard ultimate development to a high level of efficiency.

We have been very thoroughly informed that the farm and home development program is an approach to the whole farm and home as a single unit. While we heartily agree this doesn't mean that our research must also deal with the total farm and home unit to be useful. Certainly, some work on the choice of combination of enterprise may be necessary in some areas and the effects of one activity, such as fertilizer applications, must be traced through the whole farming operation. But some of our most useful work can also be done on a single enterprise basis, or we might say with partial production functions instead of whole farm production functions. The basic core of the unit approach is in farmer training so that he can make effective use of the partial production function type of information in planning the farm and home as a unit.

In regard to the question of how we select the areas of economic research that will be most productive to this purpose, we see no need to enter the methodological controversies of "what is a problem" or "how do you define a problem?" This selection will ultimately resolve to the best judgment of the researcher using what information is already available. Economic theory can outline the potential areas but we can't afford the time to methodically go about "empirically filling in" the complete theoretical framework. Especially in the farm and home development program we are substantially "under the gun" to produce. What we can do in the next year or so may have a very great influence not only on the success of the program but also on its very existence. Based on the knowledge of a complete theoretical framework, which defines the potential areas of opportunity, and on what we already know about the nature of underdeveloped farms, we must make a judgment to select research problems on which our results will contribute most to development and have

the greatest practical significance. I am afraid that we aren't even going to be allowed much time for what we might call exploratory research to establish these problem areas for economic research.

Specific Problem Areas

Our consideration of problems for economic research in this area cannot avoid being fairly heavily shaded by experience with and knowledge of underdeveloped farms in Wisconsin. To the extent that this is true it may lead to the omission of problems that are important in other areas. No outline of this nature, however, could propose to include all areas of useful research even in one area. It should, however, serve to demonstrate the basis of selecting research problems in such a way that it can be readily applied to other specific areas.

Many areas of economic research are important to the farm and home development program but are not peculiar to it. They are also important aspects of a broader farm management program. Farm adjustments to outlook and longer run adjustments to changing economic conditions are examples of such research areas. The importance of such research areas is pointed up and accentuated by the farm and home development program but not being peculiar to it should probably not be considered as economic research organized specifically for use in the farm and home development program.

Fertilizer

In a good part of the U. S. the application of more fertilizer is probably the number one income generator. The research job of determining response to fertilizer (or types of fertilizer) includes soil scientists but involves enough economic aspects to be considered in the field of economic research too. At a minimum, the economic researcher should cooperate in the design of fertility experiments to ensure that they obtain the information necessary for adequate economic interpretation in the presentation of results.

Any fertility experiment is, of course, only applicable to a limited soil classification so an initial task of research planning is to select the soil classifications on which experiments will be conducted in such a way as to get the most information from available resources that are always limited.

The specific design of fertility experiments depends greatly on the nature of soils and how much is already known about fertility responses. Less elaborate designs can often be used if the experiment is undertaken specifically for its contribution to a farm and home development program rather than as a contribution to the fundamental knowledge of soil sci-

ence. This simplification of design is possible primarily because some of the element combinations can be omitted for purposes of the farm and home development program, if their practical economic significance is judged to be small, even though they might be important from a purely soil science point of view.

In our own case at Wisconsin we have about reached agreement with soil scientists that a limited number of element combinations will be necessary in order to select the combination of elements with the greatest practical relevance on some soil types. But we do expect that we will be able to present results to farmers, and to possibly conduct subsequent fertility research in terms of a single combination of elements without incurring a loss that would be large enough to have practical economic significance. We hasten to emphasize, however, that our cooperative fertility experiments are undertaken specifically for their contribution directly in farm application rather than as fundamental soil science research. Even assuming that our judgments and expectations should prove to be completely correct for one soil condition and rotation, they cannot be generalized to other areas by the transplant method.

Other aspects of fertility research can be generalized more broadly, In designing such research it is essential to obtain estimates of response at lower levels of application as well as determining the rate of application that gives maximum additional net return per acre. We need continuous response information rather than response at a few discrete levels. This is necessary because the developing farmer, being restricted more by capital than by acreage, can develop faster by getting the maximum additional net return per dollar he has to spend on fertilizer, rather than by getting the maximum additional net return per acre on a small portion of his farm. Maximum additional net return per dollar spent is achieved at a lower rate of application. We have found response on some soils to be such that applying at the rate to obtain maximum additional net return per dollar spent gave a rate of accumulation (from limited capital) almost double the rate obtained by applying the maximum net return per acre rate on a smaller acreage.

Credit

Since the capital scarcity is a major problem on underdeveloped farms it would seem logical that economic research on the use of credit would hold a considerable potential. It does hold some potential but no magic solution.

The major credit problem on the underdeveloped farm is, as the farmer commonly expresses it, "you can't get a loan unless you can prove you don't need it." The emphasis on security, instead of future productivity

of the investment, seriously impairs the availability of credit to those farmers who have probably the greatest opportunities to make productive use of credit. Research that traces out and shows the additional income earning capacity that can be gained by the use of credit for farm and home development can help bring credit into more effective use in this role. We can't budget out the productivity of credit on every farm and any use of "typical" or "representative" cases has limitations in direct application to individual farm situations. Such research can, however, serve two important functions: (1) It can establish the fact that credit can contribute greatly to development in terms of increased earning capacity, and (2) it can set a pattern by which both lenders and borrowers can analyze the addition that credit can make to earning capacity, using available technical and economic information as applied to the particular situation of an individual farm.

A survey of the credit needs of agriculture is currently quite remote from the immediate problem of getting credit into more effective use to speed farm and home development. Changing and adapting credit facilities would undoubtedly help in many cases. But we aren't going to get credit into its potential role in farm and home development unless borrowers and lenders can analyze and appraise the future productivity of credit on an underdeveloped farm. If we can accomplish that step, it can be a powerful force in changing the credit policies and facilities we now have.

Leasing

Leasing could be a more effective means of speeding capital accumulation and development if we could accomplish more flexibility in the conventional leasing contracts, so the beginning or developing farmer could gain the size and efficiency advantages of an established farm with limited capital to offer. This would permit a break from the 50-50 livestock share lease, for example, so a renter could start, in the extreme case, with a fixed input of only his labor and a corresponding share of operating expenses. He would get a correspondingly smaller share of total product but in most cases could accumulate his capital stock more rapidly because of the greater efficiency and productivity of a developed farm.

This may be essentially an educational problem but economic research could make a contribution in much the same way as discussed above in regard to credit.

Timing of Operations

Economic research in the timing of farm operations can contribute greatly to the farm and home development program because substantial

economic benefits are to be gained and in many cases little or no additional expenditure is involved. Some of the more dramatic examples would be research that determined the most economical stage for cutting hay crops, the economical pattern of dairy calving to coordinate the milk production pattern with seasonal price changes, the timing of pig farrowings to take advantage of seasonal changes in pork prices, the most profitable market weight for hogs considering pork and feed prices as well as seasonal price changes, and an almost endless list of other economically important timing problems.

Costs

If we are going to use the approach of comparative rates of return in alternative development opportunities there will be need for some research on the cost of these alternatives. This, of course, is not a cost-of-production concept but rather one of providing cost information on the practices or methods that represent major development alternatives. Such cost information should be designed to deal with cost structure, relating cost to volume or scale. This is especially important to the farm and home development program because many possible alternatives are very efficient and productive at large scale but very ineffective in the development of a small scale farm.

Cost structure is very important in such areas as selecting economical hay handling equipment, or in mechanization in general, as well as in other practices such as conservation. In considering some alternatives a procedure of cost estimation based on supporting experimental data can be used to facilitate the adaption of cost research to the individual farm. We are now using this procedure to analyze the investment required and operating costs in irrigation.

Possible Conflict Between Rapid Development and Conservation

A strong desire to develop a farm rapidly can result in soil erosion and depletion in many areas. We could use economic research on what is a safe rate of development. This would be an investigation of the effect of alternative cash producing enterprises on the soils of specific areas, to determine the effect of rapid development, and somewhat depletive practices for a short time, as compared with a slower development, or less depletive practices in any one year.

In some cases young farmers have developed capital stocks rapidly in a few years with intensive corn cropping and hogs, and have shifted to dairying or beef later. In some cases after a twenty year period they will have lost less soil through erosion than would have been the case had they developed more slowly and been in dairying or beef right from the start. This is true because they started in dairying or beef with sufficient

capital to achieve the scale and use the practices that were profitable and good soil conservation too. Developing more slowly in dairying or beef from the start they might not have developed these practices, at least for many years. But these are just guesses and opinions. We need more specific research information on this question.

Outside Sources of Income

We have not personally given much thought to the nature of economic research that would facilitate or encourage the underdeveloped farmer to supplement his family income (and even the development of his farm if he chooses) by engaging himself in part-time nonfarm activity. This is, however, an area that we must recognize. Research designed to facilitate the movement of people from agriculture would be of similar relevance too.

Recognition of nonfarm opportunities in this way is a product of our interpretation of the basic purpose and intent of the farm and home development program; which is concerned not only with the low income (and standard of living) problem in agriculture but also with helping the beginning farmer to get established. We might say that it is concerned with the development of the human resources that are now underdeveloped and located within agriculture. Increasing the volume or efficiency of agricultural production is not of primary concern in this program except as it contributes to the development of the human resource. In this sense, then, we must recognize the nonagricultural opportunities to develop the human resources located in agriculture.

Within the problem area of developing the farm and the home together there are many more potent opportunities for economic research. The purpose of these specific examples is only to demonstrate the type of economic research that can contribute to the success of the farm and home development program. It is important to work on research problems that contribute information on the areas of high potential to farmers. It is also important to recognize that the individual farmer must be able to apply that information to his own individual farm and home planning process.

Presentation of Economic Research

The pure journalism of making research reports easy to read and understand is important in all our research. It is probably even more important with farm and home development cooperators because they are commonly less familiar with such a source of information. There are also important reasons why we should be especially concerned with the form of presentation of research material for use in the farm and home development program.

The manner in which research material is to be presented to farmers

can guide the scope and conduct of the research. For example, the presentation of fertility response information in the farm and home development program, as discussed earlier, should be interpreted in terms of how to obtain the maximum rate of additional net return per dollar spent as well as how to obtain maximum additional net return per acre. This has important implications for the design of fertility experiments.

The manner in which research material is presented can greatly affect its usefulness as a teaching device. If interpretation is made specifically to the underdeveloped situation, the presentation of the research results can be very useful in training both county extension staffs and farmers in the basic job of farm planning itself.

Recognition of the teaching or training value of research reports is really a recognition that, especially in a farm and home development program, a sharp line cannot be drawn between research and extension. The researcher can contribute greatly to the progress and success of the farm and home development program by preparing material that we might classify as crude budgeting, if as research at all, but which, even as demonstration material, can be productive. This would be a dangerous basis on which to build a research career; but at times it can serve an important role in the training aspects. Quite apart from the incidental fact that many researchers are also officially engaged in formal teaching, it is difficult for the researcher to avoid some responsibility in the training aspects of the farm and home development program.

Research Techniques

Particular analytical techniques are not to be associated with economic research organized especially for use in a farm and home development program itself. There are no techniques of analysis specifically for use in farm and home development research. Each problem defines its own techniques. Techniques of analysis for farm and home development research are, however, worthy of some brief consideration in this context because of the ease with which some of them could become inappropriately associated with this kind of research.

Linear programming might appear to be a tailor-made technique for farm and home development research. In its conceptual nature it can be readily used to program successive steps of development with resource restrictions. In its application to farm and home development there are peculiar limitations that do not necessarily prevail in its other possible uses. If the expansion path is programmed for the average or typical farm in an area, its adaptability or application to the individual farm situation would be greatly limited by the uniqueness of that individual farm situation. It might be very helpful if employed by county extension people (or

specialists) to program the expansion path for individual farmers. But this would not contribute to the end product of a farmer better able to plan his own development and adjustments. This might violate some of the noneconomic purposes of the intent of the farm and home development program. Of more immediate concern, it would greatly restrict the number of farmers who could be "serviced" with limited resources, as the cooperating farmers would never graduate to doing their own planning. On the other hand, linear programming would probably prove a bit complex for the individual farmer to master for use in his own planning. This does not mean that linear programming can't make useful contributions to a farm and home development research program. But it isn't the magic golden machine out of which we can crank all the answers to the farm and home development problems, in the form of blue prints for the development of individual farms or the typical farm in any area.

Whole farm production functions encompass the organization of the entire farm and can be used to define an expansion path. They also encounter the same limitation of adapting an "average" to individual farm situations. If used to define an expansion path, they can only slide farms along the same production function within the current stage of development, instead of moving them onto the production function of a more advanced stage of development. Alternative paths of expansion or development must specify form of input and production techniques with more refinement than is practical in the whole farm production function.

As discussed earlier, economic research undertakings need not encompass the whole farm organization to be useful contributions to the farm and home development program. Partial production functions and partial budgets can be used effectively as the coordination in a whole farm unit approach, as in the planning process of the individual farmer. At our present stage of developing economic research material specifically for use in a farm and home development program, rather simple techniques can yield important contributions.

DISCUSSION: IMPLICATIONS OF FARM AND HOME PLANNING FROM THE COUNTY EXTENSION WORKER'S VIEWPOINT

STUART BRABANT
County Agent, Henderson County, Kentucky

I have worked as a county agent in Kentucky for 30 years, working on many different kinds of programs and projects for the benefit of farm people. I have done a good deal of farm management work, including account book analysis. I have studied the Missouri balanced farming program. I was agent in the first pilot county in Kentucky to do intensive work in farm and home planning, and

did 4 years work in planning and followup there. I am in another county now, and have a group of families in the farm and home development program now. Perhaps this experience has given me a fair perspective of the program from the view of a county worker.

County agents have many programs today. We started doing personal work with farmers—cooperators—leaders. Then we adopted bigger projects and county programs, better organizations to work on big problems of production, marketing, soil testing, artificial breeding, purebred livestock, and special problems in our counties. We adopted the use of mass media, meetings, newspaper articles, circular, letters, radio and TV. Now there is a move to get back to the personal, intensive, on the farm method of working with the farm family. I have had 5 years experience in this recently.

Looking at it now, what do I, as a county worker, think?

1. The day of the big general farm meeting is over. Folks have too many other places to go now.

2. Big projects remain—for example, public policy, marketing, the price squeeze, soil conservation and fertility, weed control, disease and insect control, new varieties of crops, new methods of handling livestock, pastures, farm management.

3. Radio and TV are still good media, county newspapers are still good.

4. Some meetings are still worthwhile, but must be well prepared and on specific subjects on which information is desired.

5. Farm and home development is a good method of teaching, intensively. It will get results on the farms worked with and on some neighboring farms. Good demonstrations and good extension leaders can be developed. Up to this time we have never really tackled the vital problem of the farm family and faced their problems with an actual project. This program does face the basic problems of the farm family. It takes lots of an agent's time, and takes good personnel. Many agents and specialists are not well trained. They do not have the farm management background for this type of work, especially with commercial sized farms, or even with the large family sized farm. It takes right good men to tackle some of the farm management problems and decisions that men with an investment of from $25,000 to $75,000 have to handle. To get men like this, men that will merit the confidence of farmers who take part in the program, will take considerable money. I wonder if the taxpayers will stand, over a long period of time, for this amount of money needed.

Other drawbacks are that farm and home management is a dry program. Economics lacks glamour and news appeal. It is not spectacular. Also, farmers have been led to think the government "ought to do something."

In our state, our program has been built on small groups of 12 to 20 families a year going to about 9 meetings, making a plan, and then having the agents followup on the execution of the plan. Many families recoil from so many meetings. The present setup of homemakers clubs and their type of organization takes so much of the home agent's time that little is left for followup in farm and home development. Also, the average age of home agents is low, and many of them have not had background training in facing family and home problems—similar to the lack of training of many county agents. It is one thing to put on an alfalfa demonstration or a demonstration in canning or freezing; but a totally different thing to counsel with homemakers and farmers on the big problems and decisions they have to make in management. On the other hand, this offers a challenge to the extension service to do these things. The

work is very interesting; progress made by families has given me great personal satisfaction.

I believe we can do some farm and home development work, and continue many of the projects in our regular extension program. If we do expand the program greatly, it will take more people, and better trained people, and much more money will be required. It may, or may not, be worth it.

I believe that in each county the present workers might have a limited number of families that we work with intensively, with close followup, and use them more or less as demonstrations. They will also help to keep our feet on the ground.

I believe we must do farm and home planning with more people—offering larger groups a small dose of the program and advising them from time to time on request. Perhaps 15 to 20 families could be handled as demonstrations. Perhaps 50 to 75 families might come each winter to a county meeting or two to get some of the principles of management, and then work out their own program from reference material and other literature we can furnish them.

A limited amount of followup can be done, according to the needs of the families cooperating. That is the program I have planned for next year, to be done by the regular extension staff.

From the standpoint of administration and research, we at the county level need the following:

1. Simple forms for farm people to use in helping to make plans and decisions.

2. More and better reference material that farm people can read and understand. We might have several sets of material—at different levels.

3. We as workers need much more training in the economics of management of the farm and home. Many of us do not have the training necessary to teach this big program; we must know how if we are to get the confidence of the top farm people.

Many specialists need to gear their thinking to how their subject fits into a whole farm plan.

I do not agree with Mr. Staniforth when he says a goal is not the starting place. You would be surprised how many farmers do not have a real objective. We can start them thinking about a goal, and they may change their goal, but we can inspire them with new ideas and alternatives. If they get the idea, they will find the "income generator." I like Mr. Staniforth's ideas on "Presentation of Economic Research" and "Research Techniques." Certainly we need more research in farm management such as account book studies, etc.

I do agree with most of the ideas given by Mr. Nesius. We have talked about this project a great deal, and our ideas are fairly well together.

DISCUSSION: ECONOMIC IMPLICATIONS OF FARM AND HOME PLANNING WORK

C. B. RATCHFORD
North Carolina Extension Service

Mr. Nesius and Mr. Staniforth are due congratulations on excellent papers that should help clarify many points of uncertainty about farm and home development. There are many points in both papers with which I am in hearty

agreement. I would like to emphasize these points by calling them to your attention.

Both gentlemen indicate that farm and home development is a method. The fact that it is a method should be emphasized, since this concept of farm and home development helps overcome many of the objections that administrators and subject matter specialists have raised.

The discussion by Nesius of the three main areas in which farm and home planning can further the economic progress of rural families should be read and reread by extension administrators, specialists, and county agents.

Identifying farm and home planning as a technique for permitting the individual family to apply the scientific method to solving its problems is to me a unique and extremely useful concept. This definition dictates the procedure to be used in farm and home planning, and the procedure is one of the major areas of confusion today among economists and extension workers at all levels.

Nesius is to be commended on recognizing that farm and home planning is a means of teaching basic principles of individual planning. He implies, if he does not so state, that this is a major phase of farm and home planning. His caution that this objective should not be overlooked or lost in a maze of forms, restrictive assumptions, equilibrium analysis, price, quantities, costs, and the like, is extremely well taken.

I was glad that Staniforth also stressed the fact that the purpose of farm and home development is to teach people—teach them new technology, economic information, and how to use this information to obtain the goals of the family. One of the major defects of most previous planning programs is that "planners" prepared plans and gave them to the farmers. Certainly extension, being an educational agency, must recognize that its role is teaching people how to plan.

I could spent my allotted minutes discussing the points covered in the two papers, agreeing with most of the points, adding a dissenting vote here and there, and perhaps adding an idea now and then. I want to spend the time, however, discussing what I consider to be a fundamental point that relates to both papers and to farm and home development in general. This fundamental point is a working definition of farm and home development. Although there is general agreement that it is a method of teaching, there is much disagreement and cloudy thinking as to what and who are to be taught. It is essential that the concept of farm and home development be discussed and some agreement reached in the near future on its meaning.

Some people believe that farm and home development is synonymous with farm and home planning. Some of this belief is reflected in this program. The name of this session on the program is "Economic Implications of Farm and Home Planning," yet the two papers are supposed to discuss farm and home development. Nesius discusses farm and home development and farm and home planning as synonymous. Staniforth, although apparently accepting farm and home development and farm and home planning as synonymous, adds another element—namely, that the planning is directed toward "underdeveloped" farms and families.

In order to understand the objectives of farm and home development work, we need to consider conditions that were responsible for the birth of farm and home development as a national effort. The farm organizations and not the Extension Service conceived the idea, and the farm organizations and the exten-

sion services (some rather reluctantly) jointly sold the Congress on the idea. The farm organizations had two main reasons for promoting farm and home development. First, they believed that a sharp expansion of research and education could bring a permanent solution to the problems of agriculture and give farmers a high net income. This belief was undoubtedly generated due to the at least partial failure of "action" programs to solve the pressing problems. Second, while they believed the Extension Service was the agency to do the educational work, they indicated that they were not too happy with ongoing extension programs, and that new federal money should be used to redirect extension efforts.

Before explaining the redirection farm and home development is to bring about, let us look at extension work in 1953. Two salient features are evident. First, extension was working primarily with groups of people. This was apparently necessary as the number of families demanding assistance and information to be disseminated had increased over the years faster than the number of personnel. Second, extension workers were working with pieces of technology, in many cases not even explaining the economic value of the piece of technology, and it was indeed rare for the piece of technology to be related to the effect on the unit as a whole.

We have been asked many times in the last two years, what is wrong with this? Several weaknesses can be identified. Three defects of the group approach are as follows:

1. We fail to communicate with many farm people who are reached by the group methods. Some people simply do not understand the speaker and others do not get sufficient details to put the information to work. We fail to communicate in many more cases because the farmer does not recognize that the information will help solve a problem or achieve a goal, and hence ignores the information. Many farmers do not realize that they have the problem the extension worker is trying to help them solve.

2. We necessarily talk in terms of averages or standards. Farmers recognize this weakness and often ignore all of the information. As farmers become better educated and apply more technology, it will become increasingly important to adjust averages or standards to the individual farm.

3. By and large, we reach the farmers in the higher economic and social strata.

The weakness of discussing individual pieces of technology and failing to relate this to the unit as a whole, and in terms of goals of the family, do not need to be described to a group of economists.

This brief description of extension work helps indicate the redirection farm and home development is supposed to bring about in extension efforts.

The redirection is not in objectives. It is clear from the congressional hearings that the purpose of farm and home development is to teach all farmers, and to help them apply technology and economic principles with the specific objectives of increasing net incomes, adjusting production to demand, and securing a desirable rate of conservation. This is no different from objectives of the extension work in general.

The redirection is in approach. First, we are to work with individual families. Second, we are to work with the unit. We are to start with goals of the family rather than with pieces of technology and supply the information (technological and economic) that will help the family achieve their goals. (Parenthetically,

over time we should help the family achieve higher goals through our information program.) We may end up supplying the same technology that we taught with the old approach, but it is now related to a goal and the effect of the technology on other segments of the unit are known. *The big job continues to be teaching technology.* We are simply putting the technology in an economic framework within the framework of family preferences.

The farm organizations and extension leaders decided on the unit approach, because they felt it was the best means of getting families to use more of the scientific information (both physical and social sciences) that applied to their farm. *It was not their objective in specifying the unit approach to establish a farm and home planning program.* It was left to the extension services to determine what the unit approach meant, and how it could be accomplished. If farm and home planning was the technique, this was agreeable to the farm organizations.

We must keep in mind the major objective. If farm and home planning is the most efficient way of obtaining the objective, it should be used. Otherwise, it should not be used. If farm and home planning is considered simply as a technique for helping families solve problems, it probably is the best method. If farm and home planning must include in a package an inventory of all resources, enterprise combinations, and budgets, then it is not the best technique in many cases.

I want to make it clear that I have nothing against the package concept of farm and home planning. With certain families it is exactly what is needed to accomplish the objectives of farm and home development. With many other families it is simply a waste of time.

About a year ago several farm magazines described the redirected extension work as a "personalized farm advisory" service. This perhaps better describes what we are trying to do than the terms used today. This term would have perhaps helped avoid some of the criticism we hear today.

It is no secret that the farm organizations have been critical in some places of farm and home development work as they see it in operation. They have criticized the large amount of paper planning, the bookkeeping, and the small number of families assisted. Although the extension services should not sell out on a principle, the criticisms of the groups who made the work possible must be considered.

In summarizing, the points I have tried to make are as follows:

1. That a redirection of extension effort was needed, and further, the redirection was demanded when additional funds were made available.

2. That the procedures developed should be appraised in terms of the objective of farm and home development work.

Two comments on Staniforth's paper should be added in closing. We cannot accept the statement that farm and home development is to be limited to the underdeveloped farms. The name "Farm and Home Development" was coined because it has a certain amount of political appeal and is in general descriptive of the work to be done. The approach is designed to work with every family. Perhaps the only point we have really proven in North Carolina to-date is that this belief is true.

I have no criticism of the areas of research work outlined by Staniforth. Important additional areas include the decision making process, response of consumption and production to price changes, and plotting returns and costs for

a wide range of inputs and outputs. I would also add that farm and home development does not dictate the shift to applied research that is implied by Mr. Staniforth.

DISCUSSION: ORGANIZING ECONOMIC RESEARCH SPECIFICALLY FOR USE IN A FARM AND HOME DEVELOPMENT PROGRAM

P. E. JOHNSTON
University of Illinois[*]

Dr. Staniforth has developed some interesting ideas relative to the research needed to assist the farm and home development program. His ideas about the desirable scope of the program are sound. I shall comment briefly on some of his points that seem worthy of added emphasis and add a few suggestions that may contribute to a well-rounded research program.

I like the idea that the purpose of the farm and home development program is to train farm families how to plan and execute the development of the farm and home unit, and to make them better able to use the technical and economic information we can offer them. The author emphasizes training the farm family to make better decisions. That is, to decide how much land, labor, and capital should be associated with the management that is available, and to decide what products should be produced.

Within this framework the objective of these papers should be to outline the types of new research that will help farm families make superior decisions. In other words, what is most needed to supplement the economic information now available?

I agree with the author that the farm family must be more interested in the development of a plan than in a hard and fast plan that will be established as an ultimate goal. In the farm business the supply of resources is constantly changing. The labor supply may increase for a time and later decrease. The supply of capital should increase year by year if early decisions are sound. The efficiency of the management may increase, remain constant, or decrease. The goals of the farm family will change.

I would like to point out, however, that it is helpful for the farm family to have well in mind from the beginning the general outline of the system of farming to be followed. A broad framework should be established within which year to year variations may be made. From the beginning the family should have a clear-cut idea of the cropping system and erosion-control practices that are adapted to the quality of land available. They should decide to operate a grain, dairy, beef cattle–hog, or some other type of farm.

The author's idea about *income generators* is sound and has implications that should guide in the management of a farm and home development program. Farm families should be taught to use scarce resources, whether land, labor, or capital, in the most productive alternative enterprises. At Illinois we have been stressing "pay-as-you-go" planning. Some striking results have been obtained on demonstration farms. In 1954, the first year of a new plan, the production of both feed grains and forage was doubled as compared with previous periods.

[*] Delivered posthumously by Lynn Robertson, Purdue University.

This was accomplished by a change in the crops produced and by the increased use of fertilizers. Much can be learned from the professional farm managers, many of whom have been using farm planning for years. They find the weakest point in the farm business and make changes that will increase earnings as soon as possible. In the corn belt the beginning adjustments should usually be made with the cropping system and the fertilization program. A large increase in the cash and feed crops may be secured the first year. This raises problems of crop storage and often calls for increased livestock production. Thus the solution of one problem leads to the need to solve another and the development program is under way. This procedure captures the interest of the farmer and keeps him working at the project. Many farmers can be interested in this type of program, whereas few families will work out all the details of a complete plan that is developed without any connection with direct action. The problem is to teach the economic principles that will help farm families make good instead of bad decisions with respect to the use of their farm resources.

The important question is what additional economic information is needed to help farmers make better decisions. The farmer who plans well must evaluate the alternative returns from each resource input. How can we guide him in this evaluation? Obviously, each farmer has input-output ratios that apply to his operations. Practice can be taught that will increase efficiency somewhat, but each operator has a ceiling above which he will not rise. There will always be grade A and grade D farmers the same as there are grade A and grade D students. The capacity of the management largely determines the optimum combined input of land, labor, and capital.

Each operator must estimate his own returns from a unit of fertilizer and the pounds of beef, milk, or pork he can get from 100 pounds of feed. Obviously, farm records will help the individual farmer find his own level of efficiency. In addition, a group of farm records properly analyzed will establish norms against which the individual farmer may check his own operations. Detailed cost records establish for livestock enterprises breakeven points for such measures as returns per $100 of feed to the various classes of livestock.

In the absence of records the cooperating farmers should be taught to use other, even though less reliable, indicators of input-output ratios. In the hog enterprise, for instance, the number of pigs weaned per litter, the days required to produce a 225-pound pig, and the prices received as compared with the seasonal high, are measures that are useful.

In my opinion, the accummulation and publication of additional standards of performance is the most pressing need for additional research that will be helpful in farm and home development. In the north-central area such a regional project is now being organized. The objective of this project will be to develop better standards that will guide the farmer in estimating the return that may be expected from his resource inputs and to better estimate his costs. The need is for standards that cover a wider range of conditions so that they will be usable by more farmers. Inputs and returns will be secured, for instance, for farm poultry flocks ranging in size from 300 to 3,000 birds. These records will be analyzed to show inputs with variations in equipment ranging from strictly hand feeding to complete mechanization for feeding and watering. In like manner similar data will be collected for as many additional enterprises as funds and manpower will permit. Recent cost and enterprise records will be

re-analyzed to develop rates of accomplishment for varying types of mechanization, such as 2-row and 4-row planting and cultivating equipment.

The author points out the need to cooperate with subject-matter departments in the design of experiments that will provide better standards to guide farmers in their decision making. Those who design projects in all phases of agricultural research need to understand the principles that govern profit maximization for the farm unit. It is the responsibility of workers in agricultural economics to make these principles clear to those at the administrative level as well as to county workers. It is the responsibility of the county workers to teach these principles to the farm families.

THE ECONOMICS OF THE CONTROL AND USE OF WATER

Chairman: William E. Folz, University of Idaho

THE DEVELOPMENT AND PRESENT STATUS OF WATER RIGHTS AND WATER POLICY IN THE UNITED STATES

WELLS A. HUTCHINS
Production Economics Research Branch
Agricultural Research Service

Uses of Water

THE beginnings of irrigation agriculture in the Southwest are lost in antiquity. In that region, many Spanish-American and Indian communities dependent upon irrigation came under American sovereignty a little more than a century ago. Other important nuclei were the Mormon settlements in Utah, and later the Greeley colony in northeastern Colorado. In the meantime, California gold miners were using stream water to wash gold out of the ground. Hydraulic mining in western states and territories gradually declined in importance, but the lessened use of water that resulted was more than offset by the growth of irrigation and stock raising enterprises and municipalities.

Irrigation agriculture has continued to grow, and it is still on the increase. According to census returns, the area irrigated in the 17 western states in 1890 was about 3.6 million acres, and it was 7.5 millions in 1900. By 1950 this had increased to nearly 25 million acres, with an additional million and a half in other states.

Most uses of water during the 19th century were effectuated with gravity diversions from streams, accompanied in some cases by reservoir storage. In this present century, however, ground water has grown considerably in relative importance. The area irrigated solely with ground water in 1910—the first year for which census records are available—was less than 5 percent of the total, but it was nearly 29 percent in 1950. In addition to irrigation, much ground water is pumped for municipal, industrial, and air-conditioning uses.

Storage of water for agricultural, municipal, industrial, power development, and flood control purposes has progressed correspondingly. In 1950 more than one-third of all irrigated land was benefiting in whole or in part from storage facilities. Great dams and reservoirs constructed by both public and private enterprise are, in numerous localities, impressive features of the landscape.

Rights to the Use of Water

With growing demands for water of limited supplies came the inevitable question of rights of use. Water, as well as land, is property. And just as privileges of land use are rights of property, so privileges of water use are recognized as property rights entitled to protection under the due process clause of the federal constitution.

Rights of individuals to the use of water—commonly termed water rights—fall chiefly into several broad categories, or systems of water rights. With respect to watercourses, the two systems are: (1) The riparian doctrine, based upon ownership of land bordering a natural stream. Such situation of the land entitles the owner to use water of the stream on his riparian land. (2) The appropriation doctrine. This sanctions the taking of water from a stream for use on or in connection with land, which need not border the stream. The essential principle is that priority in time of beginning the diversion and beneficial use of water gives priority of right.

The riparian doctrine was brought to this country from Europe as a part of the civil law or common law, or both, depending upon local interpretation. It is generally accepted in the East. In the West this doctrine is recognized in varying degree in some of the states, but it has been completely repudiated in others. As a practical matter, the doctrine relates primarily to ownership of private land. The riparian right of a private landowner is held in the West to have accrued when title to the land passed from public to private ownership.

The doctrine of appropriation is considered to underlie early Spanish and Mexican water rights in several southwestern states, but not in Texas. There these early rights are held to have been riparian. The Utah Mormons and the California gold miners contemporaneously, but independently of each other, developed comparable systems of priority of rights to the use of water based solely upon priority in time of initiating the uses. This doctrine originated essentially in customs of occupants of public lands, by sufferance of the sovereign owner. Its application to private lands, now recognized in all jurisdictions in which the doctrine is accepted, came later.

From these several sources the appropriation doctrine spread throughout the West. In some western states it is recognized concurrently with the riparian doctrine. No eastern state has yet adopted the appropriation doctrine in the comprehensive form in which it is extant in the West.

Rights to the use of percolating ground waters divide into several systems under which ownership of land overlying the ground water supply is essential to the right of use, and, in addition, an appropriative

system comparable in most respects with that pertaining to surface sources.

The earliest principles governing rights of use of percolating ground waters were those of the English doctrine of absolute ownership. These were the easiest principles for courts to apply, because they allowed a landowner to make unrestricted use of percolating water found in his land, although some courts held that the use must be without malice or waste. Impairment or destruction of usefulness of a neighbor's water supply, caused by the first party's heavy pumping, was without remedy. Inequities of this system led some eastern courts to turn to what was termed the American rule of reasonable use. Under this rule a landowner might withdraw and use water in any quantity, so long as the use bore a substantial relation to reasonable use of the overlying land. He could not waste the water, nor could he export it from the area to the injury of other owners. Shortly after the turn of the century, California followed the eastern lead and then, in many decisions over the years, developed and refined the principle of reasonable use. The resulting California doctrine of correlative rights, which in many respects is comparable to the riparian doctrine of surface waters, accords coequal rights of reasonable beneficial use to all overlying landowners, and subjects any surplus water to appropriation for nonoverlying use. In time of water shortage, it confers upon all overlying landowners the right to an apportionment of the available water supply. Statutory application of the appropriation doctrine to rights of use of percolating water began during the late 19th century, but it has had its greatest development in the last 25 to 30 years.

The foregoing systems of water rights are those developed primarily in the customs, legislation, and court decisions of the several states. But the United States has been an interested party, first through ownership of the public domain, later because of the extensive developments of water resources that have been financed with federal funds. Early uses of water by the Mormons, gold miners, and others were made chiefly on the public domain, where for years they were acquiesced in silently by the government. Finally Congress expressly confirmed both water rights and rights of way that had accrued by priority of possession on public lands, provided they had vested under local customs, laws, and decisions of courts. This and subsequent congressional legislation accepting the application of state laws to both past and future acquirement of appropriative rights on public lands, together with the approval of the United States Supreme Court and that Court's declared view that each state is free to choose its own system of water law, have been of major importance.

Although the right of individuals to appropriate water on the public

domain pursuant to state law was thus established long ago, actual ownership of unappropriated nonnavigable water has been a source of contention for years. Many western states, in their constitutions or statutes and even in court decisions, assert state or public ownership of all waters within their boundaries, subject expressly or impliedly to private rights of use. On the other hand, the United States for several decades has been asserting its ownership of all unappropriated water of nonnavigable streams on the public domain and, in several interstate water cases, has pressed its claim upon the United States Supreme Court. In the North Platte River case the Court took note of the arguments pro and con, but pointed out that the rights involved in that controversy had been obtained by appropriations made by the Secretary of the Interior pursuant to state laws, as directed by Congress in the Reclamation Act. It was therefore concluded that so far as the narrow issues of that case were concerned, the question was largely academic. The Supreme Court has not yet ruled upon the fundamental issue.

Water Rights Systems in Practice

The courts of various eastern states have rendered decisions respecting riparian rights, but on the whole the development in this region of principles that govern rights to the use of water under the riparian doctrine has been meager. The fact that something else is needed to achieve best utilization of water supplies is indicated by the rather widespread interest currently shown in trying to work out forms of suitable legislation.

The West, on the contrary, has had a century of experience with both riparian and appropriative rights. Each state has a statute that provides for acquirement of appropriative rights; most of them similarly provide for their adjudication and administration. The riparian doctrine, however, is primarily a judicial doctrine, declared and developed by the courts with little direction or assistance from legislatures.

Conflicts between these opposing riparian and appropriative theories have occurred throughout the last century, and in some jurisdictions they are still in progress. In some states conflicts have been resolved by repudiating the riparian doctrine *in toto*. Elsewhere progress has been made toward imposing the same standards of reasonable beneficial use upon riparians as upon appropriators, under which the riparian proprietor no longer may waste water that an appropriator is in a position to use.

In a few states, as a result of legislation or court decisions, or both, riparian owners must make actual use of water, or suffer loss of their rights. Elsewhere this is not the case. A difficult problem in these latter states is that of the unused riparian right. Efforts to declare the unused riparian right subject to forefeiture without compensation, in those states in which

the right of indefinite future use is firmly held to be a property right, raise serious questions as to validity of the restrictive measures. These questions, disturbing as they are from the standpoint of best utilization of water, are inevitable under current interpretations of constitutional principles. So long as these interpretations prevail, solutions in those jurisdictions in which the unused riparian right is held to be an established property right appear to be through prescription, voluntary purchase and sale, and condemnation.

The principle of strict priority of appropriation, even in states that recognize no other doctrine, has been subjected to criticism for decades. It is true that the value of the appropriation doctrine in the pioneer stage of western agriculture is recognized, as well as the ever-present importance of assuring to a water project the continuing right to use economically, reasonably, and efficiently the quantity of water upon which its development is predicated. Also recognized, however, are weaknesses in operation, such as perpetuation of rights to specific quantities of water regardless of subsequent economic changes; decreeing of excessive quantities of water in early adjudications; and reluctance of courts to order prior appropriators to make extensive changes in long used methods of diverting, conveying, and applying water in order that thereby more water may be made available for junior appropriators. In such respects the rigid principle not only is harsh, but it is not furthering the best utilization of limited water resources.

The idea of modifying the strict principle of priority under compelling circumstances seems to be gaining in favor. This is discernible, for example, in authorization of restrictions upon newly acquired rights; administration of certain streams in sections, pursuant to stipulated conditions; and proposals for measuring existing as well as new rights by consumptive use—rather than headgate diversion—all within the framework of our constitutional policy of protecting private property rights against impairment without due process of law.

Economic as well as legal and policy questions arise in this complicated riparian-appropriation relationship. Dr. Wantrup will discuss some of these issues this afternoon.

In the field of ground water law, an outstanding development in recent years has been enactment of numerous statutes aimed at preventing or correcting dangerous overdrafts upon ground water basins. Enactments in 11 western states are based upon the appropriative principle. Generally these states are the ones with the smallest total acreages irrigated solely with pumped ground water. The problem is being attacked in several other states by imposition of restrictions in certain areas only, but not on an appropriative basis. One of these latter states—Texas—which in 1950

had the second largest total area irrigated with pumped ground water, recognizes the English doctrine of ownership of percolating water, and authorizes restrictions only within districts formed with the approval of resident property taxpayers.

Ground water law, on the whole, is now in an important stage of development, stimulated by enormous increases in use of water. The uses apparently are still increasing. Supplies in many extensive areas are overdrawn. As contrasted with surface water law, the ground water legislative field is still new, and experience in administration is limited. Opinions as to advisability and workability of different forms of public control differ sharply. Opposition in some sections is bitter. Some interests oppose any kind of control, but the chief resistance is provoked by plans that embody the appropriative principle. Despite formidable objections, the over-all trend in the West is toward statutory control, but with marked variations in form of control in which appropriation currently plays a very conspicuous part.

Weaknesses inherent in legal solutions of the problem of ground water overdraft thus far attempted will doubtless be brought into focus as more experience is had. In the meantime some attempted solutions take an essentially physical approach, without disturbing prevailing theories of ground water rights. These include acquirement of alternate supplies of water for the purpose of supplementing those of overdrawn ground water basins. Also included is proposed manipulation of replenishment and discharge of basins with a view to increasing available storage capacity and facilitating conservation and better utilization of the waters.

Organizations for Control and Use of Water

Organizations for diversion of water and conveyance to the place of use have been employed from time immemorial. In one form or another they have played an essential part in the irrigation economy of the sedentary Indians, Spaniards, Mormons, and other group settlements in the West. Towns, early districts, and mutual companies exercised these functions in the development of Utah. Mutual irrigation companies, which are nonprofit enterprises owned and operated by the water users, also became and still are important in various other regions, notably Colorado and southern California. Commercial irrigation companies, the purpose of which was to bring profits to the providers of capital, generally proved unprofitable and now are of minor importance. Growth of cities led to development of large municipal water supplies by the cities themselves, the water often being conveyed from distant points.

The irrigation district movement has been a feature of western agriculture since the 1880's. Irrigation districts are taxing entities, empowered

among other things to issue bonds payable from proceeds of assessments levied against benefited lands, and to cooperate with the United States. Their influence has centered chiefly upon financing supplemental development and improvement of existing systems, rather than new construction. The Bureau of Reclamation deals with water users on federal projects chiefly through irrigation districts organized under state laws.

In many states, numerous types of districts other than the conventional irrigation district have to do with water, not only in its conservation, storage, and utilization phases, but also its riddance and avoidance. Purposes of these districts cover a wide range, including chiefly irrigation, municipal, development and distribution of hydroelectric energy, soil and water conservation, drainage, flood control, sanitation, navigation, and recreation. The principle is being applied to replenishment of depleted ground water basins and prevention of waste and pollution of the water. This form of ground water control merits study in states in which physical and economic conditions differ so widely, from one section to another, that currently local option appears necessary to establishment of practicable public regulation.

Most recent developments in the organizational field are water authorities, both interstate and solely within states. They include large areas; and they contemplate undertakings considerably more comprehensive than those of local districts. Their development purposes may be single or multiple; or they may be created to develop plans for controlling and coordinating the use of waters of single streams or even entire watersheds.

Water Policies

Federal water policy began to develop early in the history of the nation. The power vested in Congress by the Constitution to regulate commerce among the several states was held to comprehend navigation, and control of navigable streams. This was extended to their upper nonnavigable reaches and nonnavigable tributaries if necessary to protect the navigable capacity of the main stream. Commerce power also includes improvement of navigable waters, flood protection, watershed development, generation and sale of power in connection with navigation and flood protection, and regulation of nonfederal power developments on streams subject to federal jurisdiction. Directly from the Constitution is derived the requirement for congressional approval of interstate compacts, such as those that provide for apportionment of water of interstate streams. Such compacts are as binding upon the states that enter into them as are decisions of the United States Supreme Court adjudicating their respective rights according to principles of equitable apportionment. These well grounded policies, all actively implemented, have placed the

United States government in a dominant position with respect to the foregoing uses of the nation's rivers.

Federal policies that relate to use of water for irrigation and other beneficial purposes stem likewise from other constitutional powers of Congress. Among these are the power to control and dispose of property belonging to the United States, and the power to provide for the general welfare. Policies based upon them are expressed by such acts of Congress as those sanctioning appropriative rights on the public domain, entry and reclamation of desert lands, and transfer to the states of large acreages of land for development under the Carey Act. All of these policies contributed materially to development of western irrigation. In addition is the impact upon western agricultural economy of the Reclamation Act and related legislation during the present century, which is so well known as to require but little emphasis.

Among water policies of western states may be noted: Assertion of state or public ownership of all or certain classes of water, subject to rights of use, and dedication to appropriation of waters in excess of those to which existing rights attach. Administration by state officials of private rights to use of water. Constitutional and statutory declarations prohibiting waste of water and enjoining highest beneficial use. Creation of or authorization to create districts and other political subdivisions for control and use of water. Several states extended financial aid to irrigation districts by way of purchasing or guaranteeing their bonds—in some cases at substantial loss. A few states promoted and developed water projects with state funds. State policies that have most profoundly affected their water economy are those for control of water rights and creation of water entities.

Federal and state water policies sometimes conflict. States have disputed some of the incidents of federal reclamation, such as ownership of water, forms of contracts with water users, and the 160-acre limitation. Resentment at federal influence upon local policies is sometimes heard. Nevertheless, construction costs of large reclamation projects have reached such proportions as to leave the states little or no choice other than to welcome or to seek federal funds for large-scale developments.

Some Salient Points

In the East the riparian doctrine prevails, but principles governing rights of use are not generally well developed. Some western states recognize both riparian and appropriative rights, others appropriative only. Where the doctrines coexist, the tendency is to lessen their differences. As a matter of fact, the public interest is as well served by irrigation of riparian as nonriparian land when the same standards of actual beneficial

use are applied. Both doctrines show weaknesses in practice, some economic implications of which Dr. Wantrup will discuss shortly. Substantial modifications have been made in the riparian doctrine, but in some states unused riparian rights present a difficult problem. Some modifications of the appropriation doctrine appear probable. More experience with ground water statutes is needed before appraising their workability with assurance. Political subdivisions, adequately empowered, may be capable of adjusting conflicting rights and coordinating uses of water in complicated physical and legal situations.

Federal water policies derived from the commerce power, which are longest in the making, have placed the federal government in a dominant position respecting such uses of public streams. Federal public land and reclamation policies have materially influenced western agricultural economy. Some aspects of federal water policy are the subject of controversy—witnessed, for example, by the Hoover Commission's recommendations, and by the public power issue. In some respects federal and state water policies conflict. Examples of coordination, however, include state control over navigability only in the absence of paramount federal control, and construction of reclamation projects with federal funds under water rights acquired pursuant to state laws.

SOME ECONOMIC ISSUES IN WATER RIGHTS[1]

S. V. CIRIACY-WANTRUP
University of California

1. Water Rights and Economic Change

THERE is no need to explain that my topic, as originally assigned,[2] refers to a veritable Pandora's box brimful with troublesome economic issues. If they should escape all at once, I could do no more than list them. I propose, therefore, to raise the lid only very slightly and to focus this paper on the economic issues in water rights—especially on those issues that are created by economic change. This session seemed a propitious occasion for such a theme because the preceding paper has given an excellent legal background.[3]

Attention has been given elsewhere to public investment in resources development, with its economic issues of evaluation, cost allocation, pricing, and public preference.[4] But in an economy in which resources are developed largely by private enterprise, the public's influence upon the institutional framework of individual action is no less important than influences operating through direct public investment. In water-resources development, the most important of these institutions are state water laws, their interpretation, and administration. Here, as for other property laws, economic change poses the issues of institutional lag and of flexibility versus rigidity. At the present juncture, these economic issues in water rights are acute in four important problem areas.

First, in the riparian-doctrine states of the East, increasing consumptive use of water has started a movement toward new water laws favoring appropriation. This movement has created new interest in the old problem of an alleged superior flexibility of riparian relative to appropriation rights in the course of economic change.[5]

---

[1] Giannini Foundation Paper No. 148.

[2] "The Economic Issues in Water Development."

[3] Wells A. Hutchins, "The Development and Present Status of Water Rights and Water Policy in the United States." Mr. Hutchins also commented helpfully on several legal points touched upon in this paper. Other constructive comments were made by Stephen C. Smith.

[4] S. V. Ciriacy-Wantrup, "Cost Allocation in Relation to Western Water Policies" *Journal of Farm Economics*, vol. 36, February, 1954, pp. 108-129; and "Benefit-Cost Analysis and Public Resource Development," *Ibid.*, vol. 37, November, 1955, pp. 676-689.

[5] Robert H. Marquis, Richard M. Freeman, and Milton S. Heath, Jr., "The Movement for New Water Rights Laws in the Tennessee Valley States," *The Tennessee Law Review*, vol. 23, no. 7, April, 1955, pp. 797-837. Additional references are listed in the footnotes of this article.

Second, in the appropriation-doctrine states of the West, increasing industrialization, urbanization, and recreational uses have led to changes in water demand. These changes have raised the question of whether or not the appropriation doctrine, with its emphasis on "first in time, first in right," may entail rigidities in favor of irrigation demand.[6] This holds both for the heartland of the appropriation doctrine—the Great Basin and Mountain states—and its western and eastern fringes—the Pacific Coast and High Plains states.

Third, the great increase in the use of ground water during the last generation has called attention to difficulties of applying either the riparian or the appropriation doctrine, both of which were developed primarily in connection with surface waters. This experience is especially interesting in California, which relies for slightly more than half of its total water use on ground water, and where both legal doctrines are operative side by side.[7]

Fourth, modern engineering and large publicly financed multiple-purpose projects have increased the export of water from one watershed into another. The interstate problems centering on exports from the Colorado River watershed to the Pacific Coast and the Great Plains area are well known. No less important, however, are intrastate problems that have arisen in California in connection with the "County of Origin Law"[8] and the "Watershed of Origin Law."[9] This issue of regional water "reservations" is of interest far beyond California.

In taking my illustrations from these four problem areas, I shall try to stay clear of the relevant constitutional issues such as "due process," "delegation of power," and "federal versus state law." Such issues are more in the domain of law than economics. An example is the issue of how unused riparian rights should be treated if a riparian-doctrine state moves toward appropriation.

---

[6] Jack R. Barnes, "Water for United States Industry," *Resources for Freedom* (Washington: Govt. Print. Off., June, 1952), vol. V, pp. 83-98. (Report No. 9, Selected Reports to the Commission; A Report to the President by the President's Materials Policy Commission.) Additional references are listed on pages 97 and 98 of this report.

[7] Patricia McBride Bartz, with a foreword by S. V. Circiacy-Wantrup, *Ground Water in California: The Present State of Our Knowledge* (Berkeley: University of California, College of Agriculture, Agricultural Experiment Station, February, 1950, 2d ed.), 67 p. (Giannini Foundation Ground-Water Studies No. 1.) Processed.

J. Herbert Snyder, with a foreword by S. V. Circiacy-Wantrup, *Ground Water in California: The Experience of Antelope Valley* (Berkeley: University of California, College of Agriculture, Agricultural Experiment Station, February, 1955), 171 p. (Giannini Foundation Ground-Water Studies No. 2.) Processed.

[8] California, State of, *Water Code 1953* (Sacramento: California Printing Division), Section 10505, p. 195.

[9] *Ibid.*, Section 11460, p. 205.

2. *Flexibility and the Riparian Doctrine*

Much has been written on the flexibility over time of water rights. There is fairly general agreement that the riparian doctrine has elements of flexibility and that the appropriation doctrine may lead to rigidities for reasons already mentioned. One might conclude, therefore, that from the standpoint of adaptability to economic change, a body of water law built on the riparian doctrine might be more desirable. Accordingly, some students have urged caution on those riparian-doctrine states which presently are considering changes in their water laws with greater emphasis on appropriation.[10] Let us look at this problem somewhat closer.

First, we may ask in what sense can the riparian doctrine be credited with flexibility in the course of economic change? The point usually emphasized in this connection is that riparian rights are not lost through nonuse; "new" uses, therefore, compete on an equal legal basis with "older" uses. The economic significance of this flexibility is frequently overestimated. Riparian rights are lost to upstream users—both riparian and nonriparian—through prescription. In California, particularly, many important water rights have been established through prescription. Furthermore, in "semiriparian" states—such as Washington, Oregon, California, Nebraska, and Kansas—the legislatures and the courts have substantially curtailed the significance of the unused riparian right.

Riparian rights are "coequal" and, therefore, uncertain and insecure in terms of quantitative definition.[11] If demand for water based on coequal rights exceeds the supply, some form of rationing becomes necessary. Such rationing, like any authoritative establishment of water rights among claimants, is a function of the courts; it is commonly called "adjudication." Presumably, the courts could use economic criteria, for example, the marginal value productivity of water, as basis for rationing. They could also keep adjudicated shares in the scarce supply flexible over time to allow for economic change.

Actual court cases dealing with water rationing are very few. There is an apparent tendency in these cases to exempt small users from rationing altogether; for the rest, to apply an equal percentage reduction to quantities actually used during a base period in order to equate demand and supply; to regard adjudicated shares in the supply as quantitative

[10] For example, Marquis *et al.*, *op. cit.*

[11] They are coequal within the two traditional preference classes of "natural" and "artificial" uses—provided the latter are "reasonable and beneficial." As interpreted by most courts, "natural" uses are for domestic use, garden, and livestock watering. In some riparian-doctrine states, for example, North Carolina, a permit system for consumptive uses is employed. This is a first step in the direction of appropriation. By limiting the number of permits, by issuing them for certain quantities and conditioning them in other ways, appropriation is approximated in all but name.

rights, subject to voluntary exchange between individual users—with the restriction, however, that there shall be reapportionment if the conditions upon which the original apportionment was made change sufficiently to justify it. This, at least, is the tendency in California, where the riparian doctrine has been developed furthest and where it is applied to ground water in the form known as "correlative-rights doctrine." Court cases in other states through which water rationing among coequal riparian rights has actually been accomplished have not come to my attention.

This tendency in court actions has obvious advantages from the standpoint of simplicity and judicial fairness. The economic implications, however, raise difficult issues. These are being investigated at present in our ground-water studies for two recent court actions known as the Raymond Basin and West Coast Reference cases in Los Angeles County, California.[12] Definite conclusions should, therefore, be avoided. Merely a few general points may be mentioned.

The court reference procedure[13] applied in these two cases has worked fairly effectively. Established overlying and nonoverlying uses have been recognized as coequal in right through mutual prescription. Water rationing in accordance with the "safe yield" of ground-water basins has been accomplished. Adjudication for the Raymond Basin has been accepted by the Supreme Court of California. On the other hand, the element of flexibility inherent in the riparian doctrine has been replaced to some extent by an element of flexibility more characteristic for the appropriation doctrine as explained later (Section 3). Economic criteria for water rationing have not been developed. Most importantly, in both cases alternative supplies of water from the Colorado River through the Metropolitan Water District are available. In other words, in these two cases rationing of ground water does not imply reductions of total water use by individuals. Rationing merely induces a supplementation of relatively inexpensive local ground water by relatively expensive imported surface water. The crucial test, therefore, for the social acceptance

[12] California, State of, *Report of Referee* (Sacramento: Department of Public Works, Division of Water Resources, 1943), 392 p. In the Superior Court of the State of California in and for the County of Los Angeles, No. 1323. City of Pasadena, a municipal corporation, Plaintiff, *vs.* City of Alhambra, a municipal corporation, *et al.*, Defendants. For the decision in this case see: *Pasadena* v. *Alhambra*, 33 Calif. (2d) 908, 207 Pac. (2d) 17 (1949); certiorari denied, *California-Michigan Land & Water Co.* v. *Pasadena*, 339 U. S. 397 (1950).

California, State of, *Draft of Report of Referee* (Sacramento: Department of Public Works, Division of Water Resources, February, 1952), 175 p. In the Superior Court of the State of California in and for the County of Los Angeles, No. 506806. California Water Service Company, a corporation, *et al.*, Plaintiffs, *vs.* City of Compton, *et al.*, Defendants; California Water Service Company, a corporation, *et al*, Plaintiffs, *vs.* Alexander Abercromby, *et al.*, Defendants.

[13] California, State of, *Water Code 1953*. Sections 2000-2076, pp. 66-68.

of water rationing on the basis of riparian ideology, implemented through the correlative-rights doctrine, is still to come. This test will come when adjudication is applied to ground-water basins without access to water imports.

The foregoing note of caution does not imply that rationing of ground water to balance demand with the "safe yield" of a basin is necessarily desirable. Such rationing could be accomplished effectively by employing the appropriation doctrine—as is done in a number of western states. In secular perspective, it appears fortunate for California that this approach was not chosen. Economically, ground-water and surface-water resources are closely interrelated. Depletion of ground-water resources, which to a considerable degree is economical for individual users, is not detrimental to "permanency" of the whole economy if such depletion builds up, over time, a sufficient economic foundation for the development of surface-water resources that is beyond the economic strength of individuals. This proposition is subject to an important restriction: that depletion of ground-water resources does not lead to destruction of the underground reservoir itself. Underground storage capacity is an important resource. Ground-water depletion may decrease irreversibly the use of this resource through compaction, salt-water intrusion, and other forms of pollution. The economic issue of irreversibility in the use of underground storage is involved in the two court cases mentioned. But space does not permit developing this significant issue here.[14]

If one is so daring as to attempt a summary in this complicated and controversial field, one may say that from the standpoint of flexibility in the course of economic change, the riparian doctrine offers only small advantages if applied to surface waters. These advantages are more than offset by disadvantages in other respects, such as uncertainty and insecurity in quantitative definition and discrimination against potential nonriparian uses. On the other hand, as applied to ground water in California, the riparian doctrine has facilitated the development of both ground water and surface water in the course of economic change. But under economic conditions where ground-water development cannot be "firmed up" subsequently by surface-water development, the correlative-rights doctrine is not yet fully tested.

3. *Rigidity and the Appropriation Doctrine*

Let us now turn to the economic issues of rigidity in water rights. As already indicated, these issues have been raised in connection with the

[14] The economic significance of irreversibility in the use of natural resources is developed further in S. V. Ciriacy-Wantrup, *Resource Conservation, Economics and Policies* (Berkeley: University of California Press, 1952), 395 p.

appropriation doctrine. Here again the economic significance of admittedly existing elements of rigidity is frequently overestimated. Furthermore, rigidity can be reduced through comparatively minor changes in appropriation statutes and their administration.[15]

First, it may be well to differentiate between rigidity and security in water rights. Rigidity in the sense that "new" uses favored by economic change are excluded because of prior appropriations may be undesirable economically. On the other hand, security in the sense that the individual appropriator is encouraged to develop water resources to the economic optimum is desirable. Such encouragement does not necessarily require rigidity in water rights. It does require that the appropriator is certain that all deferred revenues and costs of his development will be taken into account and fully compensated if his right is transferred to other users.

Voluntary transfer of water rights through buying and selling—with land if they are "appurtenant" or without land if they are not—is not uncommon. Appropriation rights are far better suited for such transfer than riparian rights because the former are clearly defined in quantity, seasonal distribution, priority, points of diversion, and other ways. In this respect, therefore, the appropriation doctrine favors flexibility in water rights in the course of economic change. The market for water rights and its imperfections are an interesting topic for the economist. But in this paper, I am more concerned with competition between "new" and "old" uses by means other than the market mechanism.

Most appropriation statutes establish preference classes among "reasonable and beneficial" uses.[16] The highest class is always "domestic" and "municipal"; the next highest is usually "irrigation"; the third highest class is usually "industrial"; "recreational" uses—if they are recognized as "reasonable and beneficial" at all—have generally the lowest preference rating. Some statutes, for example, in Texas, reverse the ranking of irrigation and industrial uses and also establish preference ratings for various industrial uses.

It should be noted that these preferences are operative primarily while appropriation is pending and, in some statutes, under water-shortage emergencies. After appropriation has been completed, the principle of "first in time, first in right" holds under normal conditions. In other words,

---

[15] "Minor" in terms of the legal philosophy and legislative and administrative implementation of appropriation. In terms of possible political opposition, the changes suggested below might not be "minor."

[16] For a brief but excellent summary of western water laws see: U. S. President's Water Resources Policy Commission, "Summaries of the Water-Law Doctrines of the Seventeen Western States, Appendix B," *Water Resources Law* (Washington: Govt. Print. Off., 1950), vol. 3, pp. 711-777. This summary has been prepared by Wells A. Hutchins.

after appropriations have become property rights, a senior but "lower" use does not yield to a junior but "higher" use. Municipalities and other public agencies can, of course, prevail over a senior appropriator through eminent-domain proceedings.

Some states allow municipalities to hold water rights for future rather than present needs; temporary appropriation by others is authorized with respect to the "surplus" over the present need of the municipality.[17] Municipal reservations may also be established by conditioning appropriation permits.[18] In Texas, all appropriations except from the Rio Grande are subject to reservations in favor of municipalities without the necessity of condemnation or reimbursement.[19] Such municipal reservations do not raise economic issues except the problem of compensation to the temporary appropriators. More serious economic issues are created by regional water reservations. These will be considered later (Section 4).

As far as statutory preferences are effective in allocating water among uses, the significant issue is the low ranking of industrial and recreational uses relative to irrigation. An agricultural economist may not add to his popularity by bringing up this issue; but sooner or later it will have to be met in several western states.

A fairly good economic argument could be made in favor of a reversal of the usual statutory ranking. The average value product of consumptive use is far higher in industry than in agriculture. Furthermore, in the western states, total consumptive use in industry—although increasing—is still relatively small as compared with that in agriculture. In ascertaining the value product of recreational uses—which are largely nonconsumptive—one faces the difficult problem of extramarket values.[20] An especially rapid increase in the demand for recreational uses, relative to that for irrigation uses, can be expected in several western states.

In spite of the existence of a favorable economic argument, based on the average value product, a reversal of the usual statutory ranking appears neither desirable from the standpoint of reducing rigidities in water rights nor politically feasible. Another approach to this issue seems more promising.

One may propose eliminating statutory preferences altogether—except possibly for domestic and municipal uses—and leaving to the courts the determination of which is the higher use in each situation of conflict. This is the approach taken in Washington.[21] In most other western states there are tendencies in this direction. The classification of uses into those

---

[17] California, State of, *Water Code 1953*. Section 106.5, p. 33; Section 1203, p. 49; and Sections 1460-1464, p. 58.

[18] *Ibid.*, Sections 1253-1255, p. 51. See also below, footnote 23.

[19] Tex. Bernon's Civ. Stats., arts. 7472 and 7472a.

[20] Ciriacy-Wantrup, "Benefit-Cost Analysis . . . ," *op. cit.*

[21] Rev. Code Wash., Sec. 90.04.030. See also below footnote 28.

that are and those that are not "reasonable and beneficial" implies a ranking of uses. The final decisions rest always with the courts so long as they conform to declared, constitutionally valid legislative intent. Economic change affects court decisions.

In most states, executive agencies charged specifically with the administration of appropriation statutes cooperate with the courts in redefining "reasonable and beneficial" in accordance with changing economic conditions.[22] These agencies could also cooperate with the courts in the determination of preferences. Elimination of statutory preferences, therefore, would not necessarily create an institutional vacuum. To the economist, greater participation of professionally well-equipped executive agencies in the determination of preferences is not objectionable. My legal friends, however, may raise the constitutional issue of delegation of legislative powers. I do not feel competent to explore whether or not this issue would be involved. In California, the courts have upheld executive agencies in the exercise of reasonable discretion in granting and conditioning appropriation permits.[23]

4. Economic Change and Water Reservations

Finally, a few comments on the economic issues of water reservations. As already indicated, these issues have become acute in California, but they are potentially of significance for several other western states.

Appropriation always contains an element of planning for future water needs. However, all appropriation statutes contain a "due diligence" clause. This means the appropriator, in order to perfect the appropriation, must be diligent in developing water resources for reasonable beneficial use. As just noted, exemptions from this essential requirement are established by statute for municipalities, the highest preference class of uses (Section 3). Quite different from such reservations for preference classes, and raising more difficult economic and political issues, are water

---

[22] For example, California, State of, *Water Code 1953*. Section 275, p. 35 and Sections 1253-1255, p. 51.

[23] Sections 1253 and 1254 of the California Water Code provide that the Department of Public Works shall allow appropriations under terms and conditions which "in its judgment" will best serve the public interest in water conservation. However, in acting upon applications the Department shall be guided by the policy that domestic use of water is highest and irrigation next highest. The California Supreme Court, in *East Bay Municipal Utility Dist.* v. *State Department of Public Works*, 1 Calif. (2d) 476, 479-481, 35 Pac. (2d) 1027 (1934), upheld the action of the State agency in inserting in a permit, pursuant to these statutory provisions, the following condition: "The right to store and use water for power purposes under this permit shall not interfere with future appropriations of said water for agricultural or municipal purposes." This decision was called to the author's attention by Wells A. Hutchins.

reservations for whole regions as established by the two "area of origin" laws mentioned in the beginning (Section 1).

Of these, the Watershed of Origin Law is more sweeping and economically more significant in spite of the fact that it applies only to the Central Valley Project, whereas the County of Origin Law applies to the whole state. The essential part of the Watershed of Origin Law is the following:[24]

> In the construction and operation by the authority[25] of any project under the provisions of this part a watershed or area wherein water originates, or an area immediately adjacent thereto which can conveniently be supplied with water therefrom, shall not be deprived by the authority directly or indirectly of the prior right to all of the water reasonably required to adequately supply the beneficial needs of the watershed, area, or any of the inhabitants or property owners therein.

These provisions are in some respect analogous to the riparian doctrine which, as we know, is recognized in California side by side with the appropriation doctrine. A respected legal opinion[26] holds, therefore, that the two laws will stand up in court if and when tested. But these provisions go much further than the riparian doctrine. The areas of origin are so broadly defined as to include nonriparian lands. Furthermore, they receive a prior right—not a coequal right—to all future "reasonable and beneficial" uses.

The reservations created by the area of origin legislation apply only to public water resources development, that is, primarily by the state of California and those state and federal agencies to which water filings by the state are assigned. An appropriation by a municipality, a public district, or a private user is not subject to the prohibitions quoted above. This situation—which is sometimes not sufficiently appreciated—may result in discrimination against appropriations initiated by state and federal agencies in favor of later appropriations by others. Junior appropriators may, for some time, encroach upon the available water supply and obtain a better right than the senior public appropriator because only the latter will have the responsibility of satisfying the eventual demand from the areas of origin. This encroachment, added to the uncertainty concerning the quantities eventually needed for the areas of origin, forms a serious threat to public water development.

In fairness to the areas of origin, one should also note that the very fact

---

[24] California, State of, *Water Code 1953*. Section 11460, p. 205.

[25] The term "authority" refers to the Water Project Authority of the State of California.

[26] Henry Holsinger (Principal Attorney, Division of Water Resources), "Water Reservations for Counties and Areas of Origins." An address before the Commonwealth Club of California, March 24, 1955.

that primarily water development by the state is involved gives economic justification to some form of water reservations. State water development is supported by contributions from the areas of origin. This contribution may be smaller than that from the areas of destination. Still, the economic issues would be different if the costs of water development were borne entirely by the areas of destination—as is common in California if water is transported from one watershed to another by a municipality, a public district, or a private user.

In actuality, such considerations of economic fairness are less important than the political issues. Public water development requires the political support of areas of origin as well as of destination. Areas of origin will not give their support if they are afraid that the public undertaking may curtail their potential future development. On the other hand, areas of destination, which bear the greater portion of the costs, contain a greater portion of the population, and have greater economic strength, will not give their support if they know that their water rights are uncertain and insecure.

A minimum basis for a solution of this dilemma would seem a removal of the uncertainty and insecurity of water rights for areas of destination. Public projects need secure water rights clearly defined in acre-feet per annum, seasonal distribution, points of diversion, and other ways customary for appropriation. Such rights can be given only if the future needs of the areas of origin, likewise, are clearly defined and limited. Physical, economic, and political issues are involved. A number of proposals have been advanced in the California Legislature that tend in this direction.[37] A discussion of the economic implications of these proposals would require another paper. It seems possible that agreement on this basis will be reached.

In spite of this possibility, the economist must confess a certain uneasiness with respect to the general proposition that the relations between water rights and economic change are effectively taken into account through regional water reservations, however clearly defined. For the economist, the kind of water use is certainly of no smaller and frequently of greater significance than its regional distribution. An approach emphasizing flexibility would seem a desirable supplement if not alternative to planning for a "frozen" regional distribution of water use. Such an approach would rely less on regional water reservations than on transfers of water rights if and when needed in the public interest. Such transfers may be accomplished through voluntary agreement and sale or through con-

[37] For example, Assembly Bills 3057; 3108; 3686; 3799; and Senate Bill 1640. (1955 Regular Session.) There is also a proposed constitutional amendment (66) which asks for ascertaining the water surpluses and deficiencies in all sections of the state.

demnation under due process and with full compensation for deferred revenues and costs. For both procedures, appropriation rights are better suited than riparian rights, as already suggested (Section 3).

Condemnation raises, of course, a number of issues that go far beyond the field of economics. Condemnation of water rights for "public use" is well established (Section 3). The "public interest," however, is a much broader and more evasive concept. Some experience in this area is available. The state of Washington permits any person to condemn a lower water use for a higher use.[28] For this purpose any beneficial use is declared to be a public use. The courts determine which use is the higher one on the basis of the public interest. This experience needs careful study constitutionally, politically, and economically. Before such studies are available, recommendations are premature. Besides, my assignment was to raise issues, but not necessarily to solve them.

[28] Rev. Code Wash., sec. 90.04.030.

ORGANIZATION AND ADMINISTRATIVE ARRANGEMENTS FOR AN EFFECTIVE WATER POLICY

HARRY A. STEELE AND MARK M. REGAN[1]
Production Economics Research Branch
Agricultural Research Service
U. S. Department of Agriculture

ORGANIZATION and administrative arrangements are of strategic importance both in formulating policy goals and in effectuating their attainment. The impact of water problems and policy is felt at every level of government and organizational issues concerning water management arise at each level. Despite the many commission and committee studies and reports in recent years, progress toward the crystallization of thinking on the nature of the organizational arrangements needed to deal with water resources has been slow. Unresolved issues remain one of the chief characteristics of the nation's water policy.

Water policy and organizational arrangements are mutually interrelated. The type of water policy we establish has a direct bearing on the kind of organization and functions essential for carrying out its provisions. At the same time, the kind and distribution of functions and responsibilities may materially affect the policy developed and applied. Ideally, the type of organization should depend on policy goals. Realistically, the institutional considerations likely to bear on organizational arrangements are certain to affect policy.

In the idealistic approach, the process would begin by defining the principal characteristics of desired goals. Thereafter, it would consider the functions essential for achieving these goals and would distribute the responsibility for them in accordance with the performance capacity of various levels of participation. The end result of the ideal process would be an effective operating mechanism for resource planning and management.

Resource Policy Goals

Policy has been defined as a settled or definite course adopted and followed by a government, institution, or individual. "The policy of any unit is the direction in which it means to go, the lines of future action it intends to follow."[2]

The chief purpose of policy is to orient plans. "A plan is a policy given concrete form in a particular situation."[3] Policy may be established by

[1] The authors are indebted to Donald J. Lehman, General Services Administration, for helpful suggestions on the content and form of this paper.

[2] John D. Black, *et al., Farm and Other Operating-Unit Land Use Planning,* Cambridge, Mass., 1955.

[3] *Ibid.*

adopting a stated set of goals or evolving piecemeal through progressive formulation of a series of specific plans. In either instance, planning and policy-making require continuous study, revision, and change to reflect changing needs, to keep pace with new technologies, and to recognize the evolution of political attitudes. The main advantage of an overall policy framework is the continuing necessity for systematic consideration of all related short-term and long-term aspects of decisions concerning a given proposal. When attention is centered on a specific project, these aspects are often disregarded.

The resource policy goals that follow are modifications of those suggested by the Missouri Basin Survey Commission:[4] (1) The policy should strive to attain eventually the comprehensive development of all land and water resources in the local area, state, basin, and nation. (2) The policy should encourage diversified development, should respond to changing needs, and should assure a balanced investment, which would advance the program by logical priorities on a consistent course. (3) The program should be planned on the most economical basis that will maximize net benefits for widespread distribution, and costs should be borne in direct relation to benefits received. (4) The people who will be affected by the policy should have ample and continuing opportunity to participate in the formulation of the program and to influence its operation. (5) The combined efforts of local, state, and federal governments should be employed in carrying out the policy and program. (6) The policy should recognize our limited water supply, and preferences in the use of this vital asset should reflect the public value of competing uses.

Essential Functions

In order to achieve the resource policy goals indicated, the principal program management functions that would need to be performed at one or more levels of participation include:

1. *Resource planning and evaluation.* Careful planning is essential if sound programs are to be developed. This includes establishing specific objectives for various segments of resource programs; developing consistent standards for formulation, evaluation, and selection of projects; application of systematic estimating techniques and procedures; review and appraisal of project plans; provision of adequate basic data and research; scheduling investigations in proper sequence; and arrangements for periodic review and revision of plans.

2. *Supervision of construction and installation.* The installation of structures and the application of measures necessitate scheduling construction operations; establishing specifications for structures and measures; pre-

[4] Missouri Basin Survey Commission, *Missouri: Land and Water,* 1953, p. 62.

scribing rules and regulations for construction contracts, force account operations and compensation arrangements for acquired property; establishing requirements for easements and rights of way; supervision and inspection of construction; and approval of completed installations.

3. *Operations management.* Systematic maintenance and coordinated operations are essential if the benefits of any program are to be fully realized. Management of operations includes regulation of reservoirs to maximize their effectiveness; coordination of system-wide activities; carrying out legislative requirements; and arranging for effective maintenance of installations.

4. *Resource budgeting.* Periodic preparation of resource budgets is essential in obtaining the necessary authorizations and appropriations. Budgets should take into consideration resource goals, national requirements, levels of economic activity, urgency, balance between purposes, and geographic distribution. Preparation of a consolidated annual resource budget would rule out piecemeal activities and provide an annual review of projects and program interrelationships.

5. *Financial management.* Arranging for the division of financial responsibility among various participating interests is essential in cooperative programs. This includes establishment and application of consistent cost-sharing policies and procedures; fixing rates and assessments; negotiating agreements and contracts and supervising their execution; and setting up and supervising accounts for reimbursable purposes and determining charges and payments for various purposes and participating groups.

6. *Coordinating related resource developments and activities with water-management projects.* In order to assure effective programs, maximum use should be made of many interrelated activities and authorities. These include education, credit, and other incentives to stimulate participation by individuals and groups; utilization of authority to control use of resources through zoning, land-use ordinances, subdivision and building regulations, and water laws. In addition, various types of resource districts may need authority to enter into contracts, issue bonds, and levy taxes in order to carry out assigned responsibilities.

7. *Integration of functions and responsibilities.* In order to achieve an effective resource program, this maze of functions and responsibilities requires unified direction in an institutional framework. Such direction should offer means of harmonizing competing uses and conflicting interests, assuring widespread participation in decisions, sharing responsibility keyed to authority, participation and benefits, and using the combined efforts of various levels of government in balanced and coordinated efforts.

Distribution of Responsibility for Functions

Interest, authority, and ability to perform functions effectively would appear to be the main considerations in assigning responsibility for functions among the various levels of government.

The establishment of uniform standards and criteria might be performed most effectively at the regional or national level. This would include setting overall goals for development of resources, use of consistent evaluation and cost-sharing standards, coordination of operations, approval of basinwide resource budgets, coordination with national policy and related nationwide resource programs, and various integration activities essential for establishing a comprehensive resource program.

Primary responsibility for exercising legislative authority to control land and water use, the execution of local district agreements, and the provision of features that are largely of local concern can usually be carried out more effectively if assigned to state and local groups.

However, most functions would appear to require varying degrees of joint participation by federal, state, and local governments if resource policy goals are to be achieved. This would include most phases of planning and evaluation, management of operations, preparation of budgets, and financial management.

Joint participation in performing such functions appears to be consistent with the division of governmental responsibility in the resource field between federal and state authorities. The responsibilities assigned to the states are extensive and their participation is essential for an effective resource program.[5] Equally essential is the utilization of federal authority, with its responsibility for reflecting the broad public interest in providing assistance in planning and financing resource programs. In order to be most effective in serving the various interests and making optimum use of the authorities and devices available, account must be taken of the rights and desires of the different participating groups and provision must be made for reconciling differences. In case mutually acceptable compromises cannot be reached, organizational arrangements should provide assurance that the broader interest would prevail.

The prevailing distribution of governmental responsibility for various types of resource programs varies considerably. Rarely are interrelated activities under the jurisdiction of different agencies or governmental levels advanced on a fully coordinated or integrated basis. Variations in responsibility stem from several sources. These include legislation applicable to particular projects and programs, conflicts of jurisdiction and interest, differences in financial ability, diversity in authority granted

[5] S. V. Ciriacy-Wantrup, *Resource Conservation*, Berkeley: University of California Press, 1952, p. 352.

resource-management agencies, and political attitudes. The resulting situation creates a challenge for sound and acceptable institutional arrangements.

In these circumstances, it is not surprising that an almost endless variety of arrangements have been suggested for local, state, river-basin, and federal participation. Examples of the types of organizations that might exercise authority and the problems likely to be encountered are outlined in the sections that follow.

Local Organizations

In recent years there has been much discussion of local participation and responsibility in the development of land and water resources. States have authorized the creation of specialized local districts of many types to deal with the development of land and water resources. District types include soil conservation, drainage, levee, irrigation, water conservancy, river regulation, reclamation, and public power. Aside from those for conservancy and river regulation, local districts have been formed largely to carry out single-purpose types of development.

Invested with appropriate powers, local districts are effective agencies for the development of resources. They may undertake limited developments on their own initiative, or they may take an essential part in cooperative activities with state and federal governments. For comprehensive resource programs, multiple-function watershed- or conservancy-type districts provide a more effective means of representing local interests and fulfilling obligations than the more limited purpose districts. Among the questions that need to be faced in establishing local districts are the appropriate size, their relationship to single-purpose organizations and traditional local governments, the means of coordinating operations of neighboring districts, the nature and extent of financial authority, and the methods of assessing charges.

The recent passage of the Watershed Protection and Flood Prevention Act has posed a new set of responsibilities for local organizations. The program authorized by this act is, in effect, one of federal technical and financial assistance to local organizations for watershed, irrigation, and drainage programs. The local organization must apply for the program, cooperate in planning, carry out the construction, furnish rights-of-way and any necessary water rights, and provide for operation and maintenance. The federal government will provide technical assistance and financial aid for part of the construction.

This reveals the need for a local organization with adequate financial resources and the authority to meet these responsibilities. The initial standard soil conservation district act did not suggest the powers to tax

or to incur indebtedness. Only in California and Colorado do soil conservation districts have taxing power. Neither did the standard act include the power of eminent domain, and only Arkansas and California added this power.[6]

As a result of these limitations in the powers of soil conservation districts, a serious problem exists as to what should be done to meet the local responsibilities required in the watershed act in order to take advantage of federal assistance. Should the soil conservation district enabling acts be amended or should new districts be created?

The pattern of state action is not clear. Some states—Colorado for example—have amended their soil conservation acts to empower soil conservation districts to carry out watershed projects and to levy taxes for this purpose. Other states—Tennessee for example—have provided for watershed districts to carry out the program.[7]

In the immediate future, there should be intensive research on and discussion of the responsibilities of local districts under the watershed program and of the powers needed to meet them.

State Organizations

In a water-development program the states and their political subdivisions must assume an active and responsible role, for they are integral units in the broad institutional framework of water-resource development.[8] The extensive powers of states over the use of land and water resources could often be more effectively used if adequate and properly staffed organizations were available.

As water becomes an increasingly critical element in our economic life, the states will need to examine the laws under which water is controlled and used and to devise new state agencies to administer these laws. With the trend toward federal grants-in-aid for local development, the states will need to make adequate provision for establishing local districts for resource development and to provide more guidance to these subdivisions.

Several states have successful water-resource planning and development agencies. The Montana Water Board is an outstanding illustration. Kansas has just created a water board with comparable powers. Many states have agencies to administer water laws, but they lack the power to plan and develop resources. A large number of states have created special

[6] W. Robert Parks, *Soil Conservation Districts in Action*, Ames: Iowa State College Press, 1952, p. 14.

[7] Data from an unpublished manuscript by Kirk Sandals, Soil Conservation Service, June, 1955.

[8] *Missouri: Land and Water*, p. 247.

study commissions to examine water problems and recommend changes in state law.

Recognizing that the states are faced with serious water problems, the governors at their December 1954 meeting in Chicago passed a resolution directing the Council of State Governments to make a study of water problems. This included appraisal of the various legal doctrines relating to water rights, the possibilities of developing new bases for water rights and new legislation for watershed organizations.

Regional and River Basin Organization

While the states need many changes in their laws and internal organizational policies, they also face difficult policy issues in working together on interstate problems. These include the division of water in interstate streams, pollution control, and joint planning and development.

States may cooperate with each other in many ways. Uniform and reciprocal laws, and administrative agreements are examples. However, the interstate compact is the chief form of coordination of water control and development. Many interstate compacts have been used to divide the waters of an interstate stream or for similar purposes. In some instances, states with common problems have established planning and coordinating agencies by interstate compact. In other instances the compact has provided for a representative of the federal government.

In the last 20 years the river basin has been generally accepted as the appropriate physiographic unit for planning and developing water resources. The interrelated and competing uses of water within a river basin result in varied and complex problems that can be solved best by integrated action within its natural boundaries. This principle has been recommended by all major commissions and organizations on water policy. It is recognized in congressional acts and administrative orders.

Although there appears to be agreement as to the objective of river-basin development, the kind of organization needed to meet the objectives of basin planning continues to be controversial. It has long been a subject of debate out of which has come several proposals for river-basin organization.

Since 1949 interagency committees have been created by administrative action in the Missouri, Columbia, the Pacific Southwest, Arkansas-White-Red, and New-York–New-England basins. These are committees of interested federal agencies and states engaged in activities relating to water resources. They operate by mutual agreement, and to a limited extent they achieve a measure of coordination by frequent consultation and review. Attention is usually limited to the authorized programs of the respective members. The Arkansas-White-Red and New-York–New-England

committees have carried on elaborate investigations under congressional and executive direction. They issue voluminous reports on the resource-development potentials of their areas.

The Tennessee Valley Authority Act created in 1933 a government corporation to develop water, land, and other resources of the valley. This corporation was given authority to make decisions, and responsibility for resources as a unified whole. It was directed by law to work cooperatively with and through local and state agencies. The Tennessee Valley Authority has served as a model for similar organizations recommended in other river basins. Consideration was most active in 1937 and 1938[9] and again in 1944 and 1945 when a Missouri Valley Authority was debated.[10]

The Water Resources Policy Commission recommended that Congress set up river-basin commissions to coordinate surveys, construction activities, and operations of federal agencies in the several basins. These commissions would be guided by independent chairmen appointed by the President, with state agencies participating in the planning process.

The Missouri Basin Survey Commission recommended a 5-man Missouri Basin Commission to direct the resource-development activities of the federal government and to coordinate them with the resource-development activities of the states. The recommendation provided that the commission must be ratified by 7 states before it could become effective.

A minority of the Survey Commission, however, recommended a Missouri Basin Commission with essentially the same powers created through an interstate compact. The compact approach has been favored also by the Missouri States Committee, the Council of State Governments, the American Farm Bureau Federation, and other organizations. Usually only advisory powers are proposed for the compact commission.[11]

Senator Hennings, Vice Chairman of the Missouri Basin Survey Commission, introduced a bill in 1954 that provided for a federal commission in combination with an interstate compact.[12] By the Hennings formula

---

[9] William E. Linchtenburg, "Roosevelt, Norris and the 'Seven Little TVA's'," *Journal of Politics*, Vol. 14, No. 3, August, 1952.

[10] *Water Resources Law*, Vol. III, Report of the President's Water Resources Policy Commission, 1950.

[11] Revised draft "Missouri River Basin Compact." Prepared for the Missouri River States Committee by the Council of State Governments, January, 1953. It is interesting to note the change in powers for the compact commission between this study and the first one "The Missouri Basin's Water Resources, Organizing for Operation," prepared for the Missouri River States Committee by the Council of State Governments, September, 1951. Also see Frederick L. Zimmerman and Mitchell Wendell, "Representation of the Region in Missouri Basin Organization," American Political Science Review, March, 1954.

[12] S. 3325, 83d Congress, 2d Session.

the commission plans would be reviewed by the compact board. This bill was designed to assure for the basin the full advantages and benefits of both the majority and minority proposals.[13]

Recent studies of the basic organization for river-basin development include those by the President's Advisory Committee on Water Resources,[14] and those of the second Hoover Commission and the Commission on Intergovernmental Relations. The report of the Advisory Committee is nearing completion and the reports of the two latter commissions were released early in the summer of 1955.[15] The Hoover report proposes a Federal Water Resources Board, which in turn would set up river-basin commissions to represent federal, state, and private interests. Their functions would be limited to planning and project coordination. They would not be administrative bodies; nor would their boundaries coincide rigidly with drainage areas. The report suggests that the scope and purpose of basin commissions should vary in accordance with changing economic, social, and political conditions.

National Planning

A series of unresolved policy issues are encountered at the national level. These revolve around the plans and programs of various agencies, the coordination efforts of the Bureau of the Budget, and the activities of interested congressional committees.

The main issues are (1) achieving coordinated water policy and giving positive direction to planning and scheduling of water-development projects; 2) providing independent review for engineering and economic feasibility; (3) scheduling projects in relation to the overall budget and the need for the services of the projects, and (4) presenting programs to Congress so that it may have alternatives to choose from within the general framework of feasible projects.

In the 1930's, the National Resources Planning Board, and in more recent years the Federal Interagency River Basin Committee[16] and the Bureau

[13] U. S. Senator Thomas C. Hennings, Jr., "Statement in the Senate on Introducing Bill to Establish a Missouri Basin Commission and Compact Board," Press release, April 19, 1954.

[14] Established by Executive letter, May 26, 1954, initially as the Cabinet Committee on Water Resources Policy.

[15] Commission on Organization of the Executive Branch of the Government, "Water Resources and Power" (two volumes) June, 1955; and the Commission on Intergovernmental Relations, "A Report to the President for Transmittal to Congress," June, 1955. The Intergovernmental Relations Commission recommeds the establishment of a permanent Board of Coordination and Review to advise the President and Congress on a coordinated national resources policy at the National level and between it and the States; and that similar agencies be established at the State level.

[16] The activities of this Committee were modified, and its name changed to Inter-Agency Committee on Water Resources by Executive letter, May 26, 1954.

of the Budget have tried to achieve coordinated policy and to establish standards for planning water projects. The National Resources Board established regional committees and compiled lists of projects. It also issued reports that attempted to set standards and procedures, such as "Public Works Planning" and "Regional Factors in National Planning and Development." The Interagency Committee was established following the dissolution of the Resources Board. Until the last year, its monthly meetings have been largely devoted to review of reports. It also established several standing subcommittees.

A major effort toward achieving uniformity was the preparation by the Subcommittee on Benefits and Costs of the report "Proposed Practices for Economic Analysis of River Basin Projects." This report compared evaluation procedures followed by the various agencies, and for the first time presented a reasonably consistent approach for project analysis. The Bureau of the Budget has issued Circular A-47, which prescribed by executive regulation many of the procedures outlined in the Subcommittee's report. Although efforts to achieve more coordinated policy and uniform planning procedures have made progress, much remains to be done before there is agreement.[17]

Most groups studying national water policy have recommended an independent board of review. The proposal of the Water Resources Policy Commission is typical. It recommended that Congress should authorize a board of review to analyze and review all projects and programs before their presentation to Congress. Such an agency should have the authority to reappraise all findings of economic feasibility, to consider all programs in terms of broad national interest, and to modify proposed programs in the public interest. Some groups would have the board go further and set the standards and procedures for planning projects.

The first Hoover Commission proposed that the rivers and harbors and flood control activities of the Corps of Engineers be transferred to the Department of Interior. It expected to coordinate water-development projects by putting all major construction in one agency.

The second Hoover Commission recommended that the President's Committee on Water Resources be transformed into a water resources board in the Executive Office of the President. This board would consist of 5 cabinet members and 5 public members recruited from engineers, economists, and others of recognized ability. It would have a nongovernment chairman. Its main functions would be to recommend broad policies to the President and to coordinate plans and activities of agencies at both

---

[17] "Discussion of Budget Bureau Circular A-47 and the Related Power Partnership Principle," *Hearings before the Committee on Interior and Insular Affairs*, House of Representatives, 84th Congress, 1st s.

the Washington level and in the field. The Commission expressed the view that only a small staff would be required, as the resources of government agencies would be available. The report further rcommends that the staff of the Bureau of the Budget be strengthened in order to evaluate fully the merits of water-development projects presented for appropriations. The functions would be similar to those of the coordinating board proposed by the intergovernmental Commission, which would also report to the Congress.

From time to time there has been discussion of improving ways in which interrelated river-basin activities of different agencies might be handled by various congressional committees. One solution that has been suggested is the development of a coordinated program and a unified budget for each basin, which would aid the Congress and its committees in their determinations.[18] The modification of congressional committee functions and the provision of more adequate professional staffing has also been proposed.[19]

Conclusions

The implementation of water-resources policy requires appropriate administrative machinery supported by an adequate legislative base. The powers of both state and federal governments need to be utilized, as each level of government possesses certain powers that the other does not have, and each has a distinctive contribution to make. The integration of these powers at the local, river-basin, and national levels is essential as the foundation for effective organizational arrangements. Provision needs to be made for the integration and coordination of federal, state, and local participation at all stages of resource development, including the establishment of project objectives, collection of basic data and research, planning and evaluation, scheduling construction, project and program operations, and cost-sharing arrangements.

The major problem appears to be that of developing organizational arrangements balanced in a way that will harmonize conflicts of interest sufficiently to be acceptable to the participating groups. The lack of progress in adopting at least certain features of the many proposals that have been made in recent years for improved organizational arrangements indicates the difficulty of reconciling conflicts and suggests the need for greater emphasis on getting recommendations fully understood by all who are affected.

---

[18] *Missouri: Land and Water*, p. 242.
[19] S. V. Ciriacy-Wantrup, *Resource Conservation*, p. 366.

DISCUSSION: THE DEVELOPMENT AND PRESENT STATUS OF WATER RIGHTS AND WATER POLICY IN THE UNITED STATES

RALEIGH BARLOWE
Michigan State University

Wells Hutchins is widely regarded as our leading national authority on the subject of water rights legislation. In his paper here today, he has given us a brief but comprehensive picture of our present water rights and water policy situation. I have no quarrel with any of his comments. However, I would like to elaborate upon some of the issues he has mentioned regarding surface water rights, particularly in light of our situation here in the East.

Two aspects of our present water rights situation bear special emphasis. First, the rise of our water rights system is the story of a people who have adjusted their legal doctrines regarding water use to fit the changing needs of their time and of their particular locations. And, second, even with the progress made in the past, considerable need still exists for future adjustments.

The colonists who settled our eastern states gave little thought to the question of water rights. No one worried about the fact that the 1800's would be here before the riparian doctrine would become part of the English common law. Water was plentiful compared with the demand for it, and it was accordingly treated more or less as a free good.

It was only later when conflicts of interest developed among water users that need arose for a water rights system. Most of the early conflicts involved the effects of diversions and stoppages of flow upon the time-honored use of water for domestic and navigation purposes. The riparian doctrine was developed to meet these needs; and as time went on, it was accepted by the courts in all of the eastern states.

With the settlement of the more arid lands of the West, it soon became apparent that the riparian doctrine ran counter to the paramount need of this area to appropriate waters for irrigation and other purposes. This situation led some states to abrogate the riparian doctrine and replace it with the doctrine of prior appropriation. Others modified the riparian doctrine by combining it with the appropriation principle.

When we stop to analyze the three general water rights systems we now have, we must conclude that these systems have tended to meet the needs of their respective areas. At the same time, however, we must also recognize that adjustments are needed if these systems are to meet the changing conditions of our dynamic age. Mr. Hutchins has commented on the changes needed in the West. Let me elaborate upon our surface water rights situation here in the East and some of the problems we will encounter as we try to adjust to our need for change.

One of our first needs so far as irrigation is concerned is for some clarification of our present water rights situation. Some of our courts have gone much farther than others in spelling out their interpretations of the riparian doctrine. The courts in some states have tended to interpret this doctrine somewhat rigidly by following a "natural flow" approach, which permits riparian owners to take water out of a stream only when their actions have no appreciable effect

upon either the quantity or quality of water remaining in the stream. In other states, they have favored a "reasonable use" doctrine, which permits riparian owners to use reasonable amounts of water for beneficial purposes such as irrigation.

A third situation exists in states such as Michigan where neither the courts nor the legislature have as yet indicated a definite position regarding irrigation water rights. (Here in Michigan we find it impossible to tell farmers exactly what rights they have in the use of water. When questions are raised, we expound upon general principles and point out the risks that the irrigator takes. But we usually end up with the admission that we live in a "water rights wonderland.")

Much of the uncertainty that we feel in some of our states regarding our unsettled irrigation water rights situation could be dispelled by a few strategic state supreme court decisions. In some cases these decisions might also alleviate part of our need for water rights legislation. Over the long run, however, most of our eastern states will probably find it desirable to seek legislation embodying some use of the appropriation principle. This legislation may take several forms. Some states may wish to modify their present riparian doctrine to permit the beneficial use of their surplus waters under a prior appropriation system. Others may set up special water districts with powers to integrate their use of water resources. And still other approaches may be devised in some states.

Two principal barriers now stand in the way of this type of legislation. The first of these involves the need for arousing public interest in our need for water rights legislation; while the second concerns our need for a legal basis for action.

Even with the great amount of publicity now being given to water issues, the problem of selling the idea of new legislation to the general public and to the members of our state legislatures is still far from easy. To begin with, the subject of new water rights legislation is far too complicated to be easily summarized in a single paragraph. It calls for change, for limitation of the potential and unused rights held by riparian owners, and for adjustments in long-accepted legal doctrines. In most cases, it also calls for additional government controls and for more red tape.

This combination of unfavorable factors has scared away some prospective supporters and has dampened the enthusiasm of others. But some progress has been made. Active educational programs favoring new legislation have been carried on in several states and special study committees have been set up in others to consider and draft possible legislation.

Once we build up political support for new legislation, we still face the problem of securing a suitable legal basis for action. Certain types of public control are possible under the police power. But a stronger measure of control is needed if our states are to allocate appropriation rights among particular individuals. In facing up to this situation, none of our eastern states find themselves in the enviable position that the western states enjoyed when they first accepted the riparian doctrine. Our riparian owners can point to the long-vested nature of the use rights they exercise. As Wells Hutchins indicated, these use rights are recognized by the courts as property rights; and the holders of these rights cannot be divested of them without due process of law.

A few of our eastern states have laws declaring their paramount interest in

the use made of the surface waters within their boundaries. It is possible that these and some other states may be able to exercise or reacquire some of the rights now claimed by riparian owners. In many cases, however, the reacquisition of these rights can be accomplished only by gift, purchase, condemnation, prescription, or possibly by tax reversion.

An additional factor that complicates our water rights situation is that of increasing demand and increasing competition. Here in the East, our usual problem has been that of too much rather than too little water. But with increasing population pressure and with new technology, we are becoming more and more water conscious. The development of portable irrigation equipment has favored a tremendous increase in the demand for water for supplemental irrigation purposes. In Michigan, for example, the total farm area set up for supplemental irrigation has increased almost 30-fold since 1940. And the word that irrigation practices can step up the yields of crops such as potatoes from an average of 150 to 450 bushels per acre will undoubtedly bring additional demands for irrigation water in the future.

In addition to our water needs for irrigation, more water will be needed by our growing cities. Our industrial needs for water will probably double during the next two decades. More water will be needed during dry seasons to float away the effluent from our many sewage disposal plants. Our sportsmen and recreational interests will insist that we maintain adequate supplies of clear, cool water in our streams and lakes. And our navigation and hydroelectric power people can be expected to protest any infringement of their rights.

These conflicting demands make our problem much more than just a matter of securing irrigation water rights. All of our eastern states—and our western states too—must appraise their water situations in terms of how they are going to allocate their limited water supplies among competing uses and how they can secure a distribution of water rights that will result in the maximum social benefit.

When we consider our growing competition for the use of water, our problem in securing political support for new legislation, and our need for a strong legal basis for action, it sometimes seems that the prospects for securing a better allocation of water rights for agriculture are dim indeed. But our situation is not without hope. The uses we plan to make of water have a high priority in our society. And our society has demonstrated its ability to adjust its legal institutions to meet the changing needs of time. As we modernize our water laws, however, let us always remember that new problems are bound to arise in the future and that their solution may also call for reappraisals and readjustments in our water rights system.

DISCUSSION: SOME ECONOMIC ISSUES IN WATER RIGHTS

ELCO L. GREENSHIELDS
Agricultural Research Service

To me it is regrettable that Dr. Wantrup, who has done so much constructive thinking on the economic issues in water development policy, chose to limit his paper to economic issues in water rights. Despite the fact that Dr. Wantrup has recently given attention to the issues of evaluation, cost allocation, pricing

and public preference in public resources development, I am sure that he has much more to contribute on these important and troublesome issues. His recent articles on cost allocation and benefit-cost analysis are excellent. Nevertheless, at this meeting it was hoped that we might have an opportunity to further examine some of the economic issues that continue to thwart the nation's effort to establish a sound development policy for water resources.

Dr. Wantrup's examination of the economic issues in water rights very adequately points out the general problem areas. Economic change brings with it new uses for water and also changes in the relative social and economic values of water among the several major uses. The appropriation of the right to use water on the basis of concepts of priority of uses established long ago may no longer promote the use of water for the greatest public good. It seems clear as Dr. Wantrup points out, that some industrial uses produce a much higher economic return per unit of water used than use of water for irrigation. We agree that water law should rest largely on economic values and that the establishment of water rights must recognize the need for a proper balance between flexibility and rigidity. On the one hand, rights cannot be so flexible that present developers will have too little security to risk full optimum development for beneficial uses. On the other, rights cannot be so rigid that new and higher valued uses cannot enter into competition with established uses.

Dr. Wantrup's statement that the influence of institutional framework is more important than the influence of public investment on water resources development is not fully acceptable. Currently and looking forward to the next decade or two, public investment and public programs are directly or indirectly setting the course for most of the development of surface water resources. Only on the assumption that Dr. Wantrup's reference to water law encompasses the existence of the basic concept of vested private property rights in water, can we find a basis for agreement. The way in which water rights have been established and administered does not appear to be such a crucial issue.

In regard to water rights, I should like to point out that their value or prospective value depends on public investment in no small way. In many areas rights to undeveloped water would have little value except for the prospect of development through public programs. The cost of development, if borne entirely by private capital, would be prohibitive, and no value would be attached to undeveloped water.

Of the problem areas in water rights, Dr. Wantrup has appropriately emphasized the one that relates to ground water. His analysis of the ground water rights problem is well done. I can add nothing to it except to say that I hope we shall have the benefit of his further study of this situation.

Now I shall comment briefly on the topic to which some of us had hoped Dr. Wantrup would direct his attention. A listing of the economic issues in water policy is hardly necessary for this audience. Each of us is confronted with these issues in different ways. Some may have only an academic interest. Others here are directly concerned with economic issues either through actual work or in consultation with those responsible for carrying out programs in water resources. The latter group especially needs the thinking of professional research workers who are not so deeply involved.

I would like to know, for example, how Dr. Wantrup thinks taxes and interest should be treated in the economic analysis of hydroelectric power projects and

alternative steam plants. It appears to be generally agreed that comparable rates should be used, but should hydro-project rates be used for both or should alternate steam cost rates be used? This is the essential issue that arises in the allocation procedure recently agreed upon by the Federal Power Commission, the Bureau of Reclamation, and the U. S. Army Corps of Engineers. Apparently the Hoover Commission recommends that the private rate (at least for taxes) be used while the Bureau of the Budget recommends merely that comparable rates be used without saying whether they shall be based on the cost of public-hydro or private-steam power.

The current trend toward the inclusion of monetary values for secondary, indirect, and intangible effects in determining the economic justification of water resources projects raises a number of issues. How far should federal agencies go in this direction? Does the inclusion of secondary effects have us on the verge of wasting public funds on uneconomic projects? Aside from the question of the advisability of including these indirect effects are the difficulties in measurement. Economists must get more precision in their measurements of prospective benefits if we are to get the right answers. Clarification is needed in the use of secondary benefits in project justification, cost allocation, and as a basis for repayment. The use of secondary benefits for project justification is limited from a national public viewpoint. But from a local-area viewpoint these secondary effects can provide a basis for assessing charges. The problem is how to reconcile these differences. The whole area of the appropriate base for assessing charges and repayment needs thorough analysis. One base is cost of service; another is the value of service or the ability of beneficiaries to make repayment.

Clarification of issues of this type would appear to be as important in establishing an effective water policy as the improvement of existing water law. Several such issues need to be resolved before we can be sure how or to what extent water laws should be modified. This is not to say that water right laws do not need revision nor that all such revision necessarily must wait for clarification of the broader economic issues.

DISCUSSION: ORGANIZATION AND ADMINISTRATIVE ARRANGEMENTS FOR AN EFFECTIVE WATER POLICY[1]

WILFRED H. PINE
Kansas State College

An effective policy is interpreted, I believe, by Steele and Regan to include summarily, first, the determination of direction of action intended to be taken; second, the plan of action; and third, the operation of the plan. They have listed some guiding principles for establishing a policy, described the functions needed to achieve policy goals, and showed how the functions are or may be distributed among various levels of government.

Steele and Regan state that water has many interrelated and competing uses

[1] Contribution No. 222, Department of Agricultural Economics, Kansas Agricultural Experiment Station, Manhattan.

and has limitations. They might have pointed out more carefully these characteristics, both physical and economic, because these characteristics complicate the problem of determining policy and organizational and administrative arrangements to deal with water. Are these characteristics peculiar to water and do they require unusual organizational and administrative arrangements?

Maximization of net benefits and allocation of costs according to benefits are listed by Steele and Regan among the guiding principles. The importance of these two principles needed more emphasis. They should have major roles in determining the policy and the organizational arrangements for making the policy effective.

One of the most serious weaknesses in present arrangements for planning and developing water resources is lack of provision for the association of costs and benefits. Lack of knowledge of kinds, amounts, and incidences of costs and benefits is one reason for this. It will continue to exist to some extent so long as values differ for individuals, values change, and new techniques of production are adopted. But knowledge now is sufficient to associate costs and benefits much more closely than is being done. An effective water policy depends on legal, organizational, and administrative arrangements that will provide as nearly as possible for this association. Present arrangements, for example, provide for flood control projects to be financed by the federal government, while costs of watershed programs are shared by local people.

Are there local benefits for watershed programs and not for flood control projects?

Authority is given as one criterion for distribution of functions. Authority is not assumed to be fixed and unalterable with respect to organization and administrative arrangements. But additional emphasis is needed on making changes in authority for arrangements that are suitable otherwise. Laws, rules, and regulations are not always easy to change so existing authority will influence an effective water policy. Political situations may prevent needed changes in authority. This suggests also that emphasis should be given to the separation of the functions of planning from operations. Planning and program evaluation often are not objective and are influenced adversely, if preformed by the agency responsible for construction and operation.

The functions required for an effective water policy, as I understand Steele and Regan, are in terms of planning, construction, and operation. The distribution of these functions is primarily on the basis of level of government. A local organization should be interested, able, and authorized to deal with water problems of local interest only. Some problems, perhaps most of them, will require more than one level of organization to solve them. The nature or scope of the water problem may be more important in determining responsibility at each level of government or organization than are the functions in dealing with any one problem.

The nature of water suggests almost inevitable conflicts of interest but, as stated by Steele and Regan, the broad interests should prevail. They observe that there now exists a wide variation in governmental responsibility bearing little relation to considerations of interest, ability, and authority. The resulting situation creates a challenge for sound and acceptable institutional arrangements. For example, rural and urban conflicts exist for the use of ground water in the Wichita, Kansas area. Local groups—cities, counties, irrigation districts,

and others—are interested. The area includes more than one county. Water might be obtained from distant sources including streams in which other states are interested. However, the problem probably should be solved by a combination of state and local organizations. What should be their separate and joint responsibilities?

The authors discussed, rather thoroughly, present arrangements and major alternatives that have been suggested by various individuals or agencies. This is a valuable contribution. More specific recommendations for organizational and administrative arrangements for particular or type problems would have improved the paper.

WELFARE IMPLICATIONS IN MARKETING RESEARCH AND EXTENSION

Chairman: G. W. Hedlund, Cornell University

WELFARE IMPLICATIONS OF MARKET PRICES

T. A. Hieronymus
University of Illinois

Definitions, Limitations, and Hypothesis

TO DESCRIBE the area of discussion under this broad title, a definition of terms, limitations of the area considered, and statement of a hypothesis are in order.

Definitions. In this context welfare may be defined as a level of prosperity. The title of this paper can be stated as a question: What is the relative level of prosperity resulting from an economic system in which there are market prices?

Market prices are prices established by a free interplay of economic forces. Market prices are established by various kinds of pricing mechanisms. The term market prices does not imply a particular institutional structure. Specifically, it is possible to develop a system of pricing in which government plays a role and still have market prices.

In contrast, administered prices are prices established by something other than the free interplay of economic forces. Prices may be administered by governments or by individuals or firms. The establishment of prices by governments is usually undertaken in the interest of social justice, i.e. income distribution. The administration of prices by individuals or firms is undertaken to obtain monopoly revenue. The administration of prices involves (1) the control of supplies and (2) product differentiation, which is based on buyer ignorance of quality or on control of the marketing mechanism.

Limitations. This paper is limited to the welfare of farmers and to prices of agricultural products. It is also limited to publicly administered prices.

Hypothesis. The aggregate welfare of agriculture and of individual farmers is maximized by pricing agricultural products at their market values. Conversely, systems of pricing agricultural products that seek some goal of income distribution that is determined by nonmarket considerations are detrimental to agricultural welfare.

Functions of Prices

Guiding production. Prices have certain functions to perform in the production of goods and services. Presumably this is known and understood by agricultural economists. It appears to be amazingly little understood by nonprofessionals and amazingly ignored by agricultural economists when matters of agricultural price policy are discussed. By way of quick review, I list three such functions.

1. Allocate productive resources. The pricing system should allocate productive resources in such a way as to maximize the marginal returns from each unit. This applies to both the allocation of resources between agricultural and nonagricultural production and the guiding of production within agriculture. Relative prices are the means by which the market tells producers what kinds, qualities, and quantities of products to produce.

2. Move products into consumption. The pricing system should operate in such a way that products move into consumption at the highest net returns. Each different combination of uses of a product will yield a different return and only one combination will yield the highest return.

Obviously it is impossible to consume more of a product than is produced. But it is possible to consume less by building up stocks. A function of the pricing system is to eventually move all of every product into consumption. If prices are to serve as an adequate guide to production they must find the level at which all of the supply can be used.

The pricing system must guide products through the market processes. They must establish the uses, users, places, and amounts of marketing services.

3. Regulate the rate of consumption. Agricultural commodities are produced at varying rates during the different seasons of the year and in different amounts in different years.

Supplies must be made to last until the next harvest or flush production season. At the same time they must be used up. Prices must be such that this is accomplished. Reserves of farm products must be carried from year to year to provide against short crops and to allow livestock numbers to adjust to changing feed supplies. Establishing the size of reserves is a function of prices.

Division of the economic product. Prices determine who gets what. How much farmers get to consume and save depends upon the prices they receive for the products they sell and the prices they pay for the things they buy. The wages paid for labor in relation to the cost of living establish the level of consumption of workers, etc.

This is the function of prices that people clearly understand. From the

point of view of an individual, the division of product is the single important thing that prices do.

In the thinking of individuals and in discussion of public policy, judgments are made of the "fairness" or "unfairness" of prices. Market prices, i.e., prices obtained in competitive markets, are said to be too high or too low. Accordingly attempts are made to modify them. Minimum wage laws are one such attempt. Our system of agricultural price supports is another; it is built upon a "fair" price concept.

Obviously the guiding functions of prices do not get done or get done differently under a system of administered prices than would be the case under market prices. This leads to the difficulties with which we are all so familiar from our observations of existing price-support programs. It seems to be extremely difficult to devise substitutes for market prices in performing the production functions of prices if at the same time we are to have "justice" in our economic system. It does not appear necessary to enlarge upon the difficulties that have been encountered in attempting to support agricultural prices above market levels. Current literature in the field of agricultural price policy is primarily concerned with methods of resolving the conflict resulting (1) from the necessity to perform the functions of guiding production and (2) from the alleged injustice of market prices.

This conflict is resolved in classical economic theory by stating that market prices reward each in the amount of his production and that this is a just amount except insofar as incomes are affected by charity. It further states that the welfare of individuals and the aggregate welfare are compatible and that the incomes of both are maximized when productivity is maximized.

Welfare Effectiveness of Support Programs

Underlying assumptions. The basic assumption on which price-support programs are based is an inelastic demand for farm products. These programs are of three kinds: (1) storage programs designed to stabilize year-to-year variations in prices and incomes; (2) production control programs designed to limit supplies to amounts for which satisfactory prices can be obtained and which presumably result in greater total revenue; and (3) surplus disposal programs.

Storage programs can be income stabilizing only if variations in market prices are greater than variation in market supplies. Otherwise changes in the quantity factor in the income equation will more than offset the price factor. There appears to be sufficient empirical evidence of the inelasticity of demand when *annual average* prices and quantities are related to justify the contention that storage programs are income stabilizing.

To be effective public storage programs must not be tied to an arbitrary price or prices. The prices must be equal to market prices averaged over a period long enough for random production variations to work themselves out. Our storage programs have never met this requirement.

Why do public storage programs result in greater price stability than market storage operations? First, the cost of storage is not taken into account in the price and second, the storer, being motivated by things other than profit, does not take risk into account.

Although it appears that storage program stabilize prices and incomes, their effects on average income are obscure. Is there a loss of revenue if scarcities are not allowed to develop? The answers depend upon which segments of demand schedules are relatively least elastic. Empirical evidence on this point is limited but most theoretical demand schedules are drawn with the most inelastic segments to the left. Commodity people discuss this as the chronically depressing influence of overhanging supplies. Farmers are fully aware of the short-run merit of scarcity. It may well be that storage programs result in more stable income from individual commodities but at a lower level of total income.

Production control programs for individual products involve protracted time spans. Presumably they are a permanent part of production. An inelastic demand *after short-run effects of changing supplies are worked out* is essential to their success in increasing income. Most studies of the elasticity of demand use annual average prices and quantities. The coefficients thus determined do not necessarily hold true when periods of several years are taken into account. Likely, the greater the time span the relatively more elastic the demand schedule. The important point here is that programs have been undertaken without any clear knowledge of the possibilities of their success.

However, it is likely that control programs can be made to increase total revenue from an individual product if certain conditions are met. First. the demand for the product in its domestic uses must be inelastic. That is, in the long run synthetic fibers will not replace cotton, etc.

Second, if exports are an important segment of the market, provision must be made for realistic pricing of the export fraction. This includes a multiple price system or direct public subsidy.

Third, some provision must be made for use of resources diverted from production of the supported commodity. Currently such diversion is made to other agricultural commodities. The big increases in soybean acreage in 1950, 1954, and 1955 is illustrative of the effects of production controls for selected commodities. Although measurement is difficult, losses to producers of substitute commodities may be as great as gains to producers of restricted commodities.

Specifically, wheat and cotton production limitation programs may or may not have increased revenue from these crops; but they have clearly reduced incomes of farmers who are not wheat or cotton producers. Lands taken out of wheat and cotton have been diverted, in the main, to feed grains and soybeans. Obviously producers of feed grains who are not also producers of wheat or cotton have a smaller revenue as a result of the limitation programs. The question, as far as aggregate agricultural welfare is concerned, is whether the losses to feed grain producers are smaller, the same, or greater than the gains to wheat and cotton producers.

Control programs for total agricultural production can succeed in increasing total revenue only if the demand for the aggregate of agricultural production is inelastic. This demand must be long-run inelastic. It must be inelastic after adjustments are made for kinds, quantities, and qualities of products demanded in consumption. Our price-support programs are not short-run emergency operations. It is difficult to demonstrate that any agricultural emergency has existed since 1940. Price-support operations have been designed to gain a "fair" share of the national income for farmers. They must be considered in their long-run aspects.

So far as I know there are no conclusive studies of the long-run demand for agricultural products. One fragment of evidence is the rate of consumer expenditure for food. Agricultural production has increased much more since 1939 than has population. At the same time the proportion of consumer incomes spent for food has increased. A much smaller proportion of consumer income would be required to support the 1939 dietary level than is now spent. Changes in the demand for food have been positively associated with changes in real income. Whether or not there is a casual relation is not clear.

American agriculture is an advanced livestock economy. We use much of our crop lands in the production of food grains as are needed and the balance for feed grains which, in turn, go into the making of livestock products. These are the marginal products of agriculture. It is at this margin that the long-run elasticity of demand must be measured.

If we can use meat as typical of these products then some light can be shed on elasticity. E. J. Working says, "From the standpoint of national policy concerning livestock production, the most significant result of the study is the evidence developed to show that there is a difference between the short-run and the long-run elasticity of the demand for meat. Year-to-year changes of meat supplies result in somewhat larger percentage changes of retail prices in the opposite direction. In other words, in the shortrun the demand for meat at retail is somewhat inelastic. However, if the supply of meat is decreased and the supply is maintained at that

lower level over a period of years, the price will, after its initial rise, gradually fall until it stabilizes at a point where the increase in price is less than proportional to the decrease in supplies. In other words, the long-run demand for meat at retail is elastic, and a decrease in supplies will result in a smaller aggregate retail value than will the larger supply."[1]

These retail prices must be translated into farm prices and production adjustments made. In the long run under a system of market prices production will adjust to consumer demand and the demand for agricultural products is the same at the farm level as at the retail level. The observed difference in elasticity at the two levels, when annual average prices and quantities are compared, is the result of the slow rate of change of marketing margins. In the long run, marketing margins are, of course, perfectly flexible. It appears reasonable to conclude that the long-run elasticity of demand for farm products may be greater than one.

Surplus disposal programs, both domestic and foreign, are systems for taking inventory losses on commodities that have been purchased at higher than market prices. They can increase farm income only by the amount of the subsidy. They reduce farm income insofar as they result in missallocations of productive resources that decrease the size of the non-subsidized market.

Welfare effectiveness. If we conclude that the demand for farm products is elastic the only way that publicly administered price-support programs can increase the level of prosperity of agriculture is through subsidies.

Welfare Effectiveness of Market Prices

If, on the other hand, we conclude that the demand for farm products is elastic and that there is an expanding demand for livestock products then we must conclude that the aggregate agricultural welfare is maximized by a system of market prices. Under this condition the problem becomes one of developing markets and producing for them. In the main this is a problem of improving quality and expanding high-value uses. Farmers are in the business of producing luxury products for luxury markets. Population of the United States may be malnourished but it is not undernourished. It is necessary to select the pricing system that will most effectively guide production and marketing.

It takes but a cursory comparison of market and administered prices to reach a conclusion about their relative effectiveness in this regard. A case in point is the most recent milk-support program. As soon as purchases were commenced the proportion of milk going into fluid use declined and the amounts of dried milk consumed in all uses but one decreased.

---

[1] E. J. Working, *Demand for Meat,* University of Chicago Press, 1954, p. xi.

Two of the most rapidly expanding segments of agriculture have been broilers and soybeans. The broiler industry has expanded because of a rapidly improving technology that reduced costs and because of improvements in quality. Broiler production is a notably risky business. How large would this industry be now if the first time it took losses a support program had been initiated?

The soybean industry has grown because of rapid improvements in the quality of oil, an expanding foreign market for oil, and an increasing real demand for soybean meal. Both products have had to buy their way into their respective markets with low prices. How large would be current soybean production had support prices not been relatively low? The outlook for peanuts in 1945 was quite as promising as that for soybeans. This industry became involved in an administered price program and has declined. There have also been other factors in the decline of peanuts.

The aggregate welfare of agriculture will be maximized if production of the kinds and qualities of products that the market wants is maximized. Administered price programs have resulted in the misallocation of productive resources. Sufficient correction of them to prevent further waste appears unlikely. Waste of resources cannot possibly maximize the long-run agricultural welfare.

Allocation of Agricultural Income

Granted that market prices maximize aggregate agricultural welfare, we must yet treat the problem of allocation of income within agriculture. There is great disparity of incomes within agriculture. There is said to be a problem of poverty in agriculture.

One criticism of existing price-support programs is that they do not alleviate and in some cases actually aggravate existing disparity.

It is clear that producers are paid in proportion to their productivity under a system of market prices. Is the resultant disparity socially desirable? What pattern of income distribution is the optimum one? These are questions that I do not presume to answer. They are beside the point in issues of market prices.

In considering income distribution in agriculture the deceptiveness of existing statistics should be kept in mind. Not all rural residents who are counted as farmers are farmers in any real sense. Nor is income of people who reside on farms limited to income from agricultural production. There is much part-time farming in the United States.

There is a decreasing agricultural population. It is decreasing because relative opportunities are greater off farms than on farms. A system of market prices for productive resources is allocating them between agricultural and nonagricultural segments of the economy. To hamper this

process by income reallocation programs would be to reduce total productivity.

The problem of disparity of incomes among farmers is a problem in poor relief; of underproductivity of individuals. Its treatment should not interfere with the workability of a system of market prices.

Summary

The success of price-support programs in increasing agricultural income rests upon the assumption of an inelastic demand for farm products. Such evidence as is available indicates that this assumption is not valid.

A system of market prices is more effective in performing the functions of prices in guiding production than is a system of administered prices. Market prices are especially more effective in increasing quality and quality in turn is important in stimulating higher levels of consumer expenditures for food.

WELFARE IMPLICATIONS OF EFFICIENCY AND TECHNOLOGICAL IMPROVEMENTS IN MARKETING RESEARCH AND EXTENSION*

LAWRENCE WITT**
Michigan State University

TO A considerable extent these annual meetings serve as a means to take stock of where we are as a profession. Since this subject is one to which many of us are unable to give much attention under the press of daily work loads, it is particularly appropriate that we devote attention here to some of the welfare implications of work in marketing. We need to think through the consequences of this work in a fairly complete sequence. We also need to take a good hard look at the objectives themselves, and their relationship to other goals held by society. In this setting then, it is desirable to consider how attainment of some of the moral and ethical values of American society are affected by changes in marketing and its efficiency.

The goals of our society are many and complex.[1] As economists we commonly deal with means of attaining production and pricing efficiency, economic stability and more recently with growth and development problems. Welfare economics is concerned with the scientific study of justice and equity.[2] Most economists, however, have given a major share of their attention to problems in attaining efficiency. In considering efficiency there are many levels of abstraction that may be used. It may be viewed from the standpoint of a firm or operations within a firm. Or economists may try to evaluate the efficiency with which the totality of programs, public and private, approach the interrelated sum total of goals of all the people in a society. In technical welfare terms—is the possibilities curve just tangent to the community indifference curve?[3] Presumably at this point marginal increments of equity, security, stability, freedom and consumption goods and services are all equated.

---

* Journal Article No. 1803, Michigan Agricultural Experiment Station.

** I am indebted to V. Sorenson, A. Woodard, D. Hathaway, B. French, G. Quackenbush and J. Bonnen for critically reviewing an earlier draft of this manuscript, and to a joint session of the Marketing Seminar, and Welfare and Asset Distribution Seminar, at Michigan State University for an early opportunity to present these ideas.

[1] Robert A. Dahl and Charles E. Lindblom in *Politics, Economics and Welfare*, New York: Harper and Bros., 1953 attempt to provide a general view of these complexities and their resolution.

[2] See, for example, Paul Samuelson, "Evaluation of Real National Income," *Oxford Economic Papers*, New Series, Volume 2, January, 1950.

[3] O. H. Brownlee, "The Meaning of Economic Efficiency in Terms of Possibilities and Choices," Economic Efficiency Series, University of Chicago, Summer, 1950.

Abstractly this conceptualization is appealing as an application in a broader area of the framework of economic analysis. However, if the distribution of assets, physical and personal, is variable (and to many people redistribution of income is a most important desired change) then neither the possibilities curve nor the community indifference curve is uniquely defined.[4] Moreover and concretely there are difficult problems in aggregating both possibilities and individual preferences. How do we add together members of the Rockefeller family and migratory farm laborers, and this with respect to desires for security, equity, and stability as well as for goods and services?

Every day there are hundreds of marketing decisions made by private firms, public or private research men, or by government agencies that affect the welfare of one group or another. Some people, some geographical areas, some commodities will gain in comparative advantage while others will lose. In our dynamic, fluid society most of these shifts are generally accepted as natural or inevitable. But occasionally the pressure becomes too great, the loss of income or welfare is such that individuals and groups petition for assistance in the name of equity and justice. Many of these problems are beyond the reach of present welfare economists, as economists, mostly because shifts that add income to one person by taking it from another cannot be handled scientifically.[5] Yet many agricultural economists have contributed to the operation of programs basically designed to reduce inequities. There is no way to compare the utilities lost by one person with the utilities gained by another in these programs except through political value judgments as to whose utilities are more important. Welfare economics is only able to deal with situations in which one person or group receives increased income (utilities) while all others receive the same as before (or could be given the same through compensation from the gainers). This of course means that the total product must be expanding. The latter is precisely what the majority of the work in marketing research and extension hopes to accomplish. However, as some of these come to be applied or would be applied if used, the welfare of some groups in society are worsened while others receive substantial gains. Compensation could offset the losses, but procedures for so doing at this level have not been developed and might not be sanctioned by society even if proposed.

The welfare conflicts, that result as technological advance and increased efficiency benefit one group at the expense of another, can be serious problems. Anticipation of adverse effects may lead to refusals to cooperate in research or extension programs. The expectations of gains

[4] *Idem.*

[5] Samuelson, *op. cit.*

may lead other groups to pressure for federal or state budget allocations, shifts in the lines of activity, etc. The questions of resolving equity conflicts are properly the function of the legislative bodies, and not part of our function as economists.[6] Yet an examination of the governmental process clearly indicates that the scientist, the technician, the specialist, do in part have a powerful influence upon the decisions made.[7] This is so partly because eminent scientists do stand moderately high in the prestige pyramid, and their advice is sought. It probably is true largely because such people have or are presumed to have the knowledge to evaluate alternatives that the Congressman cannot have by virtue of the many and complex problems with which he must deal. Proposals are made by technicians, with knowledge of the details of the marketing processes, which knowledge a legislator has only occasionally and more or less accidentally. For these reasons research and extension workers should devote some of their energy and funds to the study of the impact of their work upon the welfare of various groups.[8] Only in this way can they be prepared to pose alternatives to the public for eventual compromise and integration into legislative decisions. They should be aware also that relative value judgments are involved, and that the final decision made includes consideration of some alternatives in which the economist has little if any more competence than other citizens.

Finally, it should be pointed out that the conflicts of interest stemming from the welfare implications in marketing are more obvious and more explosive. Resources frequently are more specialized than in farm management. Reorganization and relocation of central market facilities for example destroys much of the value of one set of resources and creates new values, usually in the hands of different people. Resistance is to be expected. An important problem for the marketing specialist is to determine how to operate in this situation, as an economist and as a public servant.

The remainder of this paper will deal with some of the impacts of technological advance and pricing efficiency upon the welfare of different

---

[6] This should not be interpreted as accepting the position of Lionel Robbins, *The Nature and Significance of Economic Theory,* Macmillan & Co., 1937. The writer finds his position closer to that of Gunnar Myrdal, as expressed in the methodological appendices to *An American Dilemma,* Harper & Bros. 1944 or *The Political Element in the Development of Economic Theory,* Chapter 8, Harvard University, Press, 1954.

[7] Don Price, *Government and Science,* New York University Press, 1954.

[8] Willard Cochrane has made the same point in a paper "Public and Private Responsibility in Marketing" presented to the National Marketing Workshop, at Lexington, Kentucky.

segments of society.[9] Finally it will suggest a series of rules or ethical postulates that appear to be sanctioned by society, to serve as guides for the planning of projects and the day to day operations of research and extension workers in marketing. Presumably these will provide a springboard for discussion.

Welfare Impacts of Technological Advance

Technological advance or operational efficiency is an easily understood concept. It consists of improving the ratio of useful output to costly inputs, through new machines, gadgets or fuller knowledge of the production function. Of course, when prices deviate from average costs these ratios may profitably be reduced so that marginal cost and marginal revenue are equated. There are difficulties in developing these input-output ratios in marketing because services cannot be derived in quantity terms. These have been discussed by at least two marketing workshops[10] and by Black and Houston.[11] Somehow the useful output must include a measurement of service—such things as a clean store, clear aisles, attractive displays, social environment, being open at odd hours, etc—before operational efficiency can be finally evaluated. Ultimately it includes some aggregation (real or supposed) of the indifference curves of the consumers concerned for physical goods, services and the social situation, in the particular market considered.

Most of the technological advances will have a primary effect at the firm level. Many of you have heard W. C. Crow discuss how his people have developed ways to grade and pack apples with reduced use of labor, have packed freight cars with watermelons running crossways so that fewer crack en route to market, or have found ways to stack and handle cotton bales in a warehouse so that labor costs are cut in half or more.[12] If such techniques are adopted they presumably lower total costs or increase sales and hence increase profits. So far so good. But they often have the effect of increasing the supply as well.

The atomization of the industrial process, with the detailed examination of the individual operations, should not be permitted to impose a similar atomization on knowledge. As the separate processes are synthe-

---

[9] This same dichotomy was made by work group I at the Second Marketing Workshop and by Robert Rudd in a paper "Research in Marketing Efficiency" presented to the Seventh Marketing Workshop.

[10] Reports of work groups in the Second and Seventh Workshop.

[11] John D. Black and Neil T. Houston, *Resource Use Efficiency in the Marketing of Farm Products,* Harvard Studies 1-H., Harvard University.

[12] The writer has particular reference to a banquet speech at the first annual Agricultural Marketing Clinic at Michigan State University, June 17, 1955.

sized into efficient plants, there are implications for the other fixed assets of the firm which may discourage the use of the process, implications for the pricing process (to be dealt with shortly), implications for the resources now unused, and implications for the farmer suppliers and consumers. Assume as a first approximation that all of the profits remain with the innovating firms. Nonetheless, there may be important impacts on the welfare of the producer. The technological process may use more, less, or the same amount of raw product to furnish consumers with a given product at the retail level. The grocer may be able to spend a fraction of a cent per head to wrap lettuce in a plastic sack because he can cut spoilage and effect savings of more than this amount. Widespread adoption of this practice will have the effect of reducing the market for the farmers by the amount saved even if the consumers continue to buy the same amount as before. Retail sales would need to increase by more than the amount saved in order to improve the farmers' position. The consumer will prefer the waste-free product, or lower prices will induce larger purchases. The real question is "how much."

Some shifts from labor to mechanical processes are likely to lead to greater demand for the raw material. As the shift to combines and corn pickers tended to leave more grain in the field, so candling of eggs, mechanical cotton picking, etc., may result in lower yields of the final product from a given quantity of raw product. Such developments must reduce the demand for other inputs or improve quality and price, while increasing the demand for the raw farm products.

On the whole however it appears that the changes are likely to save rather than waste the raw farm product. If the new technology becomes widely adopted and if consumer prices and purchases remain the same, this will tend to reduce the farm price and increase marketing profits. However, consumer prices are likely to be reduced if price markup practices are not changed (and increase if the new technology uses farm products). The net effect on farmers' income will depend on the relations between price elasticity at the consumer level, and price and supply elasticity at the farm level and vary with the length of the time period and the speed of the farmer and consumer adjustment to new price patterns. The wider the marketing margin, the greater the inelasticity of demand and supply, and the slower the adjustment of farmers and consumers to new prices, the greater will be the income loss to the farmers.

However, if we turn from this comparative static analysis to the dynamic situation in which marketing processes operate the conclusions may be quite different. Many marketing firms are striving to increase sales and to expand their share of the market. Thus improvements in the

technical processes may lead a marketing firm to change its traditional price markups and pass the savings on to consumers. As these improved processes spread to other firms increased consumer purchases will lead to higher farm prices and an eventual sharing of the gains between the farmer and the consumer. Whether these will offset the initial losses due to farm product saving processes again depends on the relevant price and supply elasticities.

Finally the effect on other marketing cost items should be considered. Analysis here would follow along the same lines as above. Presumably the consumer would be indifferent if the technological advance came through less waste of the farm product or if it saved labor or capital. To the farmer, however, it makes a substantial difference. The more of the changes that are labor or capital saving, the greater are the chances that part of the gain will be shared by him. It should be pointed out however that savings in labor costs, rent, refrigeration, etc. are less likely to be passed on to the consumer than savings through lower farm and wholesale prices. In the former case, traditional markups must be modified, in the latter case the practices automatically lower consumers prices.

But concentrating on these details may lead to overlooking other important welfare considerations. There are likely to be more alternative opportunities outside the food industry for displaced labor than for displaced agricultural land or displaced specialized marketing capital items. Labor saving processes may expand the aggregate level of income in a full employment economy and reduce it in a partially unemployed economy. But even in a fully employed economy there are important consequences. Labor saving and capital using processes in the assembling, grading, packaging and processing of farm products usually will result in a shift in the demand for labor from points near the farm to points in or near the industrial centers. The cotton picker is an exaggerated example. Such changes will encourage labor migration from rural areas and a further centralization of the economy in manufacturing centers. Those new processes that use labor (packaging fruits and vegetables in plastic wrappers, etc.) appear to have the same effect since they generally take place well along the path to the consumer, frequently in the urban retail store. In the aggregate, if this impression is correct, the semiskilled or unskilled worker near the farm has his income (welfare) decreased, while the store worker and the skilled industrial worker making grading machines, mechanical stackers, etc. have somewhat greater employment opportunities. The worker from the small town who moves to the city to follow these opportunities has a welfare position that is hard to define if we consider the before-technological advance with the new urban residence position.

There are many more implications that might be considered. One more will suffice. The replacement of labor power with mechanical power over the past decades appears to be associated with greater economic instability but at a higher aggregate level of income. The increase in the use of capital in marketing relative to labor appears to be no exception. During periods of economic stress machinery can be repaired rather than replaced. Although a few more repairmen perhaps are needed, the manufacturing plants are likely to find new orders declining. This is the reverse of the acceleration principle. If the marketing processes had continued in the old labor using relationships, more labor would have continued to be used and paid, with some slight effect in maintaining purchasing power. By depleting the real value of its capital a marketing firm is able to continue in full operation, while the supplier of equipment is forced to close down part or all of his operations.

In the aggregate, many technological advances appear to lead to farm product saving, to lower consumers' prices, to a greater concentration of population in urban-industrial sectors of society and to a somewhat increased economic instability. Expansion in purchases and in demand may partially or largely offset the first in so far as the farmer is concerned. All of these are probably hidden in the changes as technical advance in other segments, larger population, rising incomes, government programs, etc. work through the economy. Technical advance may still breed instability but at a higher level of economic activity, which in itself creates purchasing power for the larger consumption of farm and other products.

Welfare Impacts of Pricing Efficiency

There is little point in restating here the familiar role that prices play, or in developing the concept of pricing efficiency.[13] As we know, prices are a means of facilitating decisions on the level and composition of the output for the firm, the industry and the total economy. Pricing efficiency is concerned with the degree to which these decisions are made, so as to maximize the output of goods and services in the economy.

Last year at the Penn State meetings Willard Cochrane chided us for having social aversions to helping the middleman maximize his returns.[14] There is much to be said for his argument, but it probably should not be endorsed in total; nor does Cochrane appear to intend it that way. These judgments however anticipate a particular welfare impact and make certain assumptions about the nature of competition.

Technical changes that increase the profit ratio for the marketing firm

[13] See the paper by Robert Rudd, *op. cit.*

[14] W. W. Cochrane, "Agricultural Economics in the Decade Ahead," *Journal of Farm Economics*, December, 1954, pp. 817-828.

(through changes in inputs or outputs, or both) will be temporary in nature *if* similar changes can and do occur in other marketing firms *and if* competition does exist among these firms. This may be either price competition in the Marshallian sense or nonprice competition. If the latter occurs there are some interesting questions as to whether consumers welfare or producers welfare is advanced as much, more or less than would be true if price competition occurred. I hope some of the work Bob Clodius is doing at Wisconsin will throw some light on this question.

But what if other firms cannot or do not adopt similar changes, or what if significant elements of monopoly exist? In either case both producers and consumers are hindered from benefiting from the fruits of the technical advances, but for different reasons.

Other firms may not adopt the new processes because their cost structures make such changes more, rather than less costly in the planning period considered. They may be subject to internal or external capital rationing in the same way as certain low income farmers. They may not hear about or observe these changes in a way that will show how they can be applied in their enterprise. These processes may lead to imbalance with other processes in the present plants. The classical free enterprise answer is to let such firms be squeezed out. Two comments are in order. First, both inefficient marketing agencies and low production farms seem to have an ability to persist far beyond the point normally assumed by those who argue for the squeezing out process. Secondly, there are techniques for assisting such enterprises to become more efficient. These costs may be far less to society than the continued costs of inefficiencies to the producers and consumers of these products, or the destruction of capital and blight on the lives of those operating the marketing firm. Moreover, helping them to persist may have important implications for enforcing competition, to be discussed shortly.

We turn now to the second possibility. There are disagreements as to how widespread or how limited monopoly is, in the marketing system.[15] It is not necessary to resolve this question, however, in order to move forward in this analysis. It is sufficient to assume that there are various scales of operation and a variation in the structure and extent of competition. Some of these firms like the Knock 'Em Out Packing Company are large with some degree of influence over their buying and/or selling prices. Many are large because they were, and possibly still are, more efficient than their rivals. They make profits and are able to borrow and

---

[15] For a recent discussion of this subject see the papers by J. K. Galbraith, "Agriculture and the Competitive Structure," and G. Warren Nutter, "Is Competition Increasing in Our Economy?" *Journal of Farm Economics*, December, 1954.

expand. Other firms like the Squirt Dairy Company are small and have little or no control over their buying and selling prices.

Technological changes that stem from work with the Knock 'Em Out Packing Company, and that are used by this and similar large integrated firms, would appear to be less likely to be passed on to consumers, or to be passed back to producers. They may enable the firm to increase its scale of operations and its share of the total market. They might even enable it to widen the marketing margin or profit ratios. It may encourage capital accumulation and private research expenditures. On the other hand work with the Squirt Dairy Company may enable it to compete more effectively with Knock 'Em Out equivalents in the dairy business. Distribution of the results of this work to other little squirts can have much the same effect in marketing that farm management research has with many farmers. It helps approach the economic ideal of pricing efficiency.

The welfare connotations and assumptions are evident. Market research and extension that spreads the gains more widely, either through technical processes or through improved pricing, is preferred to market research and extension that concentrates the gains in a few individuals and firms. Society apparently sanctions such actions, though not unequivocally. However, the potential gains may be much greater if the work is carried on, either research wise or extension wise, with the knock 'em outs because of economies of scale. A lot of work with the squirts may little more than repay society's costs. The economic decision must be based upon the expected part of the gains that would accrue to society through work with the knock 'em outs, through normal economic behavior plus any probable social controls that might be put into effect, and not on the potential cost reduction effects alone. However society in making legislative decisions should have information on the alternatives and the possibilities of balancing economic advance, equity, efficiency and directing that more or less work be done for the squirts than may be justified on price efficiency grounds alone.

Implications and Proposals

In recent years there has been a wider recognition than formerly that the benefits of agricultural research resides in the first instance with innovating farmers who take on the new practice, but that ultimately, in view of the prevailing inelasticities of demand, it resides largely with the consumer.[16] Many people consider it an anomaly that the research designed to benefit the farmer, is counter to his interest. On the other hand

[16] See for example, W. W. Wilcox and W. W. Cochrane, *Economics of American Agriculture*, Prentice-Hall, 1951, Chapter 27.

it is essential that agriculture be developed if the society as a whole is to continue to expand. Those remaining in agriculture share in the advance in the rest of the economy. It is appropriate to ask whether or not it is certain that agriculture received expanded research and extension efforts as a means of providing short run gains to agriculture, or as a means of assisting in the general advance of society. Most of this work gained strength after the western lands were settled and as fears of eventual food shortages began to develop. The interest of the consumer in continued supplies of food may have played an important role, at the national level, in providing the extra support needed for these measures to pass Congress.

Although agriculture has substantial political power it is doubtful if proposals such as expanded extension work or the Research and Marketing Act could have passed Congress unless senators and representatives with labor and consumer interests thought that there would be some benefits to them. If they understood more of the implications of inelastic demands they might become the most enthusiastic supporters of agricultural research and extension.

A personal proposal of an ethical framework within which marketing research and extension might operate will serve to pull together the comments made here. They should also provide some material for my critic and for discussion, after the formal session is over. Some of the statements assume, as is implied above, that the funds appropriated for research and extension in marketing are public funds and not agricultural funds. Although such funds are allocated to agricultural institutions they are expected to yield benefits to the entire society over a long period, rather than to farmers alone, and possibly not even to farmers. To save time and focus attention, six rules are separated out which the author believes represent values strongly held in our society. They are not intended to be complete, but rather to be suggestive of welfare and ethical problems that face marketing people implicitly or explicitly.

Rule No. 1. To conduct research and extension work in marketing so as to broaden the access to information. This is in accordance with a strongly held value in America that we should strive to provide equality of opportunity, even if it does result in important income transfers. Different kinds of enterprises, cooperative and private, home owned independents and integrated chains should all have an opportunity to play their proper economic role.[17] Moreover, chain store taxes, antitrust laws, etc.,

---

[17] Tibor Scitovsky, in *Welfare and Competition*, R. D. Irwin Inc., 1951, pp. 326-331, gives particular attention to the role of information in affecting the size of the firm.

suggest that society may even be willing to tip the scales a little bit to favor the smaller enterprise.

Rule No. 2. To provide information that will enable consumers to distribute their expenditures among food items, and ultimately between food and other expenditure items on the basis of facts, to the extent that consumers desire to balance costs and utilities. Economists as economists are interested in encouraging consumers to equate their own marginal utilities. Beyond this there are some groups in society interested in knowing the costs and possibilities of shifting the pattern of indifference curves. Exploration of such alternatives appears to be a proper function of economists. Similarly, calling attention to conflicts in values held by members of society, and to alternative means of resolving them, appears to be fully within our province. Thus society says it is desirable to provide information that can help consumers to reach equilibrium positions more quickly with changes in income, in family size and composition, in variations in seasonal prices, or in changes in social position, and so on. To go beyond this raises serious and tricky ethical questions. Society supports certain organizations and directs them to influence peoples' value systems in a broadly defined manner. It is the poor teacher and poor extension worker who fails to do likewise. But to urge society to adopt new programs to change value patterns in order to benefit one sector of the economy is more questionable than urging a new program because the new values are desirable in themselves. Distinguishing both of these positions from a practice of carrying on existing societal mandates to influence values, involves blurred rather than clear cut distinctions.[18]

Rule No. 3. To assist farmers in making choices among effort and investment allocated to production and that allocated to marketing, and to improve the decision making process for such effort as is allocated to marketing. There are farmers and types-of-farming areas where there is little to be gained from becoming extremely proficient in marketing decisions. In other cases investments in storage and the risks taken need to be compared with quick sale and alternative investment and risk decisions. Should the heavily indebted farmer market differently from the farmer with surplus capital? When will an extra litter of pigs or 40 acres of land take as much time and provide less income than careful market decisions? And when does the reverse situation hold true? Should the marketing of farm products become more specialized in accordance with the specialization and atomization of knowledge, or should this trend be resisted?

[18] As economists we presumably are charged by society with advocating means of economizing, of showing how to provide the goods and services desired by society with less resources and effort. But this is still a difference in kind from trying to influence society's desire for a particular set of goods and services to benefit one economic group.

Rule No. 4. To facilitate the transmission of gains in marketing efficiency through techniques to improve resource and product allocations in both production and consumption decisions. In those cases where the benefits are passed on to other sectors of society there will be changes in the coefficients of substitution in both production and consumption. Assistance in equating to these new ratios will help in attaining an equilibrium position more rapidly. Those cases in which the gains are not transmitted through normal price and marketing changes are dealt with under rules 5 and 6 below.

Rule No. 5. Where gains in marketing efficiency are not or cannot be transmitted as the economy is then operating, the obligation of the research and extension marketing staff is to make clear the costs and benefits of alternative proposals, and the individual and human values and related issues involved. This knowledge should be available to both those favorably and those adversely affected and to the political process where the decision as to the proper allocation of benefits must be made. Here society eventually must make value judgments through the operation of the political process.

Rule No. 6. In those cases where technical advance leads inevitably to economies of scale, to large scale organization, and to the concentration of economic power, another set of value judgments comes into play. Welfare economics suggests that positive steps should be taken to provide social controls to prevent a widening of marketing margins, assuming no changes in the provision of services. This means that consumers should not be made worse off because technical advance gave a few firms much greater power in the market. It would of course be possible to reduce marketing margins under these circumstances, and to make consumers better off and the continuing marketing firms no worse off. There is some indication that American society would prefer social controls that go further and force a narrowing of the margin, and provide farmers and consumers with some of the benefit of technical advance. Value judgments must be made. Economists can indicate their nature but ultimately this decision must be made by those designated to carry this responsibility and to take the risks of errors.

DISCUSSION: WELFARE IMPLICATIONS OF MARKET PRICES

DONALD L. BROOKE
University of Florida

Mr. Hieronymous has presented the case for maximum welfare in agriculture through a system of open market prices. It may be that perfect competition in pricing agricultural products would be an efficient method of allocating our agricultural resources. I think perhaps that Mr. Hieronymous is thinking in terms of the long, long run. In this case his general conclusions may be true.

I wonder, however, if the farmer and perhaps the politician are not more concerned with the short run (the productive span of the life of an individual). From an individual perhaps selfish point of view it is quite possible, that in that span of time one may profit more from administered prices. This basic conflict in viewpoint should be recognized. A free market possibly would result in greater total return and prosperity for agriculture and America in the long run.

Allocation of human resources as between agriculture and nonagriculture has not been too well handled by the price system in the past. Undoubtedly, giving farmers assurance of relatively higher income tends to perpetuate misallocations that exist. However, there may be real merit in subsidy and related programs specifically designed to correct such misallocations. Such things as programs to transfer human resources through proper child and adult education, assistance in moving to new locations and aid in obtaining industrial employment are but a few. It seems to me that, if we are going to have to live with these support programs, then it becomes even more important to develop policies and programs that will correct misallocations of people and resources as between agriculture and nonagriculture.

Returning to the paper by Mr. Hieronymous, I would question that maximum efficiency in the allocation of agricultural resources and maximum agriculture welfare can be resolved with the same system of market prices. Variable prices may result in a misallocation of resources (because of their immobility in the short run) and hence a reduction in the aggregate welfare. This suggests a need for price stability and brings up the question of whether price stability or price variability is the more desirable. There seems to be no one answer. It would vary with the commodity and productive resources under consideration. Perhaps, for most crops, a policy of price stability within seasons and variability between seasons would be desirable. Shifts in the relationship between supply and demand that are reflected by price fluctuations induce farmers to shift production. Perhaps price variablity could be used effectively to control production between seasons.

Mr. Hieronymous states, "Obviously it is impossible to consume more of a product than is produced. But it is possible to consume less by building up stocks." I submit that, when stocks have been built up, it is possible to consume more of a product than is produced in any one year. His statement is correct for perishable commodities not processed.

It is suggested that production controls, while beneficial to wheat and cotton producers, were detrimental to the feed grain and soybean producers because of acreage diverted from the former to the latter. This resulted in larger supplies and lower prices and returns to the feed grain and soybean producer groups. It is later suggested that soybeans have had to buy their way into the market with low prices. It seems to me that, in supporting the price of one commodity—cotton and its products in this case—the system went a long way indirectly toward supporting the price of a close substitute. If the price of soybean oil and meal had not been favorable for its use as a substitute for cottonseed oil and meal, relatively fewer resources would have been allocated to the production of soybeans. Soybean prices have evidently been above production cost and more profitable than alternative enterprises or the acreage planted to soybeans would not have continued to increase.

Again I quote:

We use as much of our crop lands in the production of food grains as are needed

and the balance for feed grains which, in turn, go into the making of livestock products. These are the marginal products of agriculture. It is at this margin that the long-run elasticity of demand must be measured.

That statement puzzles me. One might just as easily say that we use as much cropland to produce feed grains and livestock as is needed and the balance is utilized for food grains. Demand and factor prices determine the use of resources. In terms of consumer utility one is needed just as much as the other at the margin. The value of the marginal product from various crops determines the use of land.

I do not believe that one can use meat as typical of the elasticity of demand for all food. Substitutability of a product determines its elasticity to some extent. We can, as consumers, substitute meat out of our diet entirely and not suffer too greatly thereby. But as yet we have not found a suitable substitute for food. Therefore, the demand for all food is likely to be more inelastic than for meat in the long run.

Mr. Hieronymous says that:

> In the long run under a system of market prices production will adjust to consumer demand and the demand for agricultural products is the same at the farm level as at the retail level.

This would imply that, in the long run, the cost of services and likewise the cost of unprocessed food would each represent fixed proportions of the retail price of food. It seems unrealistic that cost of services and of food itself is divided in some fixed proportion. The supply of services comes at increasing cost. A retail grocery store may substitute food for service in marketing. If a shipment of vegetables was not all marketable and if it had to be picked over or trimmed out prior to going on the counter, it is quite possible that the labor required to perform the service might cost more than the product gained would return. In that case the store might mark the product down and sell at a loss rather than expend labor trimming it for sale at a higher price.

Reference is made in two or three instances to "quality" but the term is not defined elsewhere. Unless carefully defined, quality can be a nebulous concept. The quality of labor is measured by the value of the marginal product of its output. Quality of a vegetable is outwardly judged by its general appearance, color, hardness, softness, size, shipping ability, etc. by the producer. All of these inherent factors may be favorable yet the vegetable may not return a profit to its producer. Why? Because it does not have what people are willing to pay for—quality in a product is measured by the extent to which it will satisfy a particular desire in the mind of the consumer.

If I may be permitted one further comment, it would be this. Price supports, production controls and storage programs have been with us for various reasons through depression, war and inflation. Such programs, once they are started, are difficult to stop. They are politically expedient, particularly in election years. Acreage allotments, if employed long enough, reflect themselves to a certain degree in the value of farm property. What farmer would vote against acreage allotments when such action carried the possibility of reducing his equity in his farm and the total value of the farm? Even though many benefits may accrue to farmers in the short run, I do not mean to imply that the over-all general welfare—or even that of agriculture in the long run—is enhanced by many of our governmental control programs in agriculture.

DISCUSSION: WELFARE IMPLICATION OF EFFICIENCY AND TECHNOLOGICAL IMPROVEMENT

ALLEN B. PAUL
Consulting Economist, Washington, D.C.

A few observations are suggested by Professor Witt's thoughtful paper. Where Witt is skeptical of propositions in welfare economics, I share his attitude. One gets an uneasy feeling that the everyday meaning of human welfare becomes overly artificial when we attempt to force it into a formula. Surely income and its distribution bear on welfare, but they do not define it. Professor Stigler criticized the recompensation principle in 1943 and the criticism seems still in order. The principle can mislead us in how to advance human welfare. Recent efforts to include other goals of society into welfare equations do not appeal to me, yet, as very useful. I sense that Witt may intimate this criticism in his paper.

Many will agree that public funds should be used for the public good. If we by-pass the difficulties of defining the public good, there remains the difficulty of knowing how it can be attained. Do we really know enough about social processes? In our own area of work, do we have enough reliable knowledge about the workings of the market economy, or can we be misled?

Witt's paper contributes to our thinking in one area. He points out a range of economic effects from technological changes in marketing and provides ideas on how to advance understanding of them. Conclusions are suggested with respect to farm income, consumer prices, marketing profits, employment, economic stability, and so forth. The work is qualitative in the sense that we cannot tell how important are the influences noted. It may be, as Witt intimates, that the effects are submerged by larger forces and cannot be quantified. If so, can we ever know whether or not we treat of important or trivial matters?

There is one broad category of technological change in marketing that ought to be explored further. What can be said about changes that serve to increase the consumer valuation of products, rather than to reduce marketing costs? Reference here is to more processing, packaging and other effort that induces people to pay more for food products. What are the welfare implications? Past discussion frequently centered on whether or not the additional payment for food should be considered subtractions from income farmers would otherwise get. Further, it is said that families could get more adequate diets if less money was paid for added marketing services.

Such discussions appeal to me as superficial. Fruitful analysis requires, I believe, that we broaden the conception of the problem. The traditional boundaries of marketing are too confining. The household is a good deal more than the end-of-the-line entity in the marketing process. The household is a producing unit operating within a more or less integrated economic system. Household production processes include cooking, cleaning, laundering, repairing, child training, entertaining and many others less easily identified. The household services and products are largely for own use rather than for exchange, although the latter also occurs. The flow of household output is into the development and maintenance of human capital or into current enjoyments, or both. The household industry is probably the largest industry in the econ-

omy. It is strange that it has not been entered explicitly into analyses of market efficiency more often.

The conception of production efficiency applies to household production. In some sense, the marginal rate of substitution of inputs is affected by the ratio of their prices. The fact that the price of inputs, like the housewife's labor, needs to be imputed should not obscure the importance of our present conception. Many recent changes in commercial food products, which raise their prices, can be understood in the context of the household as a producer. For example, table-ready meats, potato chips, ready cooked cereals, cleaned and trimmed vegetables, ready-mixes, canned baby foods, and the like are demonstrable substitutes for household labor in household production processes.

Many questions can be raised here. What effect have such foods had on the reallocation of effort among the various household projects? How has this affected the efficiency in each? What is done with the freed resources? Is the household, as a firm, becoming increasingly more integrated with the rest of the economy in the sense of increasing mobility of resources between them? What conditions affect this flow in and out? How are the larger economic phenomena in production, specialization and exchange affected? Such questions are just another way of pointing out that the efficiency of the marketing system for agricultural products cannot be adequately comprehended within the conventional conception of the marketing system. Although the broader conception complicates analysis in some ways, such complications are part of reality and should save us from attributing any more to conclusions drawn from a narrower analysis than is warranted.

A final observation on achieving pricing efficiency. One senses that the emphasis on spreading more efficient production techniques among firms may help to overcome our inadequate comprehension of the conditions that make it possible for various types of firms to compete. Witt touches on the point where he notes the limitations of capital. I suspect that a follow-up of this matter, in its broadest context, would show where some very fundamental issues in market improvement lay. However, progress in gaining insights probably will require a considerable reformulation of some basic economic conceptions. In particular, many conceptions focusing on capital probably would need careful restatement.

The suggested ethical rules, that Witt would like to discuss, are by-passed here. Lest there be misinterpretation, I am in full agreement with his purposes and the general sense of the rules suggested. However, I do not handle such problems well. On tracing the implications of ethical propositions, I fall prey to metaphysical speculation with all its temptations. For my own personal conduct I ofttimes think it is sufficient to believe that society wants more reliable knowledge about the workings of a market economy that permeates and dominates its life.

AGRICULTURAL FINANCING

Chairman: Howard G. Diesslin, Farm Foundation

REORIENTATION OF POLICIES IN AGRICULTURAL FINANCING

R. C. ENGBERG*

Farm Credit Administration

THE changes in the policies, structure, and legislative framework of agricultural credit facilities in the United States since the end of World War II may be fitted into two broad developments. The first is the adaptation of credit services to the changing needs of a dynamic agriculture. The second is the evolution, mainly through a succession of acts of Congress, of a more sharply defined philosophy with respect to the role of government in providing agricultural credit services. Before considering these two major developments in agricultural credit, it is appropriate to review briefly the changes in agriculture that have been chiefly responsible for the first and at least part of the second of these general adjustments in agricultural credit policies and facilities.

Significant Changes in Agriculture

Since these changes are well known, only a brief review is needed for purposes of this discussion. Most of these changes in agriculture can be wrapped up in one term—"technological advances." Without doubt, such advances have been greater in the past decade than in any other period of equal length in United States history.

The most important of this group of changes has been the unusually rapid increase in the use on the farm and in the farm home of electrical and mechanical power and related implements and appliances. This expanded use of power and equipment has enabled individual farm families to enlarge their scale of operations with equal or less hired labor. Economic sizes of farms, therefore, increased, both in terms of acres and in total physical output. As the acres per farm increased, the number of farms has been reduced. From 1944 to 1954, the average size of all farms in the United States increased 18 percent, while the total number of farms declined 13 percent. The number of farm workers decreased by 17 percent.

Improvements in an endless number of techniques and practices have also contributed to increases in production per man, per acre, and per farm. These improvements include greater use of fertilizers and lime; better methods of disease, insect, and pest control; improved crop varieties

* Opinions expressed are those of the author and not necessarily of the Farm Credit Administration.

and types of livestock and poultry; better feeding methods; pasture development; expansion of soil and water conservation practices; and numerous other similar additions to and adjustments of farm operation. The use of these techniques and practices generally requires not only larger cash outlays for materials but frequently calls for investment in special equipment.

There are other features of these developments that have credit significance. They have greatly enlarged the technical knowledge and skills needed by a farmer who utilizes these advances effectively. By the same token, they have increased the opportunities for good management and "knowhow" and have probably widened the differentials in the rates of return to poor and good management.

Generally, the rough and otherwise poorer classes of land, even when put to their best use, do not respond to these improved techniques and practices and greater amounts of power and equipment as generously as when they are applied to the higher grades of land. Consequently, there apparently has been a widening of differentials in net return per acre and in market value between good and poor land also.

These changes and the accompanying greater differences in return to various grades of management and land have tended to aggravate the plight of the less capable farmer who finds himself on a small, unproductive farm. Low returns, coupled with high capital requirements for an economic-size operation, make it increasingly difficult for him to improve his situation. One favorable, partially offsetting feature, however is expanding opportunities for off-farm employment.

One further change of major credit significance should be mentioned in this brief review. Prices and costs have been at substantially higher levels in the past 10 years than in previous decades. The average level of the AMS indexes of prices received by farmers during 1945-54 was just about double the average for the previous 10 years, 1935-44. Prices paid by farmers for cost items of nonfarm origin increased 62 percent between the same periods, farm wages by 169 percent, and farm land values per acre by 100 percent. Because of higher unit prices and greater physical outturn, average cash farm receipts per farm rose to considerably higher levels. Likewise, with higher unit costs, expanded purchases of supplies and equipment and heavier maintenance expense, cash expenditures per farm have become markedly higher. Partly because of higher unit costs but also because of higher living standards, cash farm family living expenditures have increased substantially during these two decades.

Although not complete, the foregoing statement outlines the general setting to which farm credit services have needed to be oriented.

Adjustments in Credit Service to Agricultural Changes

Of the developments that have just been summarized, one of the most obvious effects having credit significance is a substantial increase in the total capital requirements per farm. Farmers using credit, therefore, have required larger loans. This need seems to have been recognized by most lenders. During the past decade, the average size of loans made by all lenders making farm mortgage loans increased by nearly the same percentage as the change in the average value of land and buildings per farm. In considering the differences among types of lenders in the percentage increase in average size of loans shown in the table, it should be kept in mind that there are also differences in the geographic areas and classes of farms served by the various lenders.

With respect to the figures for the average size of loans made by federal land banks, it should be noted that the full effects of the recent revisions in federal land bank appraisal and loan policy may not yet be evident. During the winter of 1954-55, new and generally higher standards for normal agricultural values were put into effect by land bank appraisers. It will not be possible, however, to observe the full effect of this new policy upon values and loans until all the local appraisal standards studies have been completed on the new basis. In general, however, the new appraisal levels are tied to farm commodity prices equivalent to 79 percent of the 1947-49 average prices and farm operating costs equivalent to 104 percent of the 1947-49 average. For the nation as a whole, appraised normal values per acre tend to average about 85 percent of average market values during 1947-49.

AVERAGE VALUE PER FARM, AND AVERAGE SIZE OF FARM MORTGAGES RECORDED, UNITED STATES, 1944 AND 1954

Year	Average value of land and buildings per farm[1]	Average size of farm mortgage loans					
		Loans made by		Mortgages recorded by[2]			All lenders
		Federal land banks[2]	Farmers Home Adm.[3]	Banks and trust companies	Insurance companies	Individuals	
1944	$9,345	$3,680	$6,590	$2,830	$7,160	$2,930	$3,390
1954	17,475	6,040	10,840	4,540	13,720	5,460	5,970
Percent increase 1944 to 1954	87	64	64	60	91	86	76

[1] Census reports.
[2] From Farm Credit Administration.
[3] From Farmers Home Administration.

This adjustment of federal land bank loan policy was designed to take account of still another of the developments in agriculture mentioned earlier. This is the widening differentials in net returns between the poorer and better grades of land. The new appraisal standards generally

contemplate relatively little increase in the normal agricultural value on the poorest grades and maximum increases on the best land.

There are several other adjustments in loan policy which the Federal Land Bank System wishes to make in order to adapt loan service more completely to the changing situation in agriculture. These have been incorporated in bills that have been before Congress during the present session—H. R. 5168 and S. 1286. One of these provisions would broaden the federal land bank loan service to part-time farmers. The law has provided that in making appraisals, the "value of the farm for agricultural purposes shall be the basis for appraisal and the normal earning power of said farm shall be a principal factor." A proposed amendment would add that "consistent with community standards, the appraisal may also reflect home advantages, and the availability to a typical operator of the property of earnings from other dependable sources to supplement the normal earning power of the farm." This provision would enable the federal land banks to serve many part-time farm properties which are not now eligible and would thus improve the credit service to an important and permanent segment of our agricultural economy.

In recent years there seems to have been an increasing number of farm families which have found it of advantage to incorporate their farm business. Since 1935 the federal land banks have been authorized to make loans to corporations engaged in the raising of livestock and having certain specified ownership and management arrangements. There seems to be no good reason for limiting the financing of family farm corporations to those engaged in livestock production. The purpose of another proposed amendment, therefore, is to permit the financing of any type of sound, family-type farming corporation.

The legal limit on the amount of federal land bank loans that could be made to any one borrower has been $100,000 during recent years. As the size and the capitalization of farms have enlarged, there has been an increasing sprinkling of family farming and ranching operations that needed and could support loans larger than $100,000. The purpose of another proposed amendment accordingly has been to increase the loan limit to any one person to $200,000. This would permit loan service to the small but growing number of cases needing these larger loans.

The proposed amendments just discussed, together with some others involving procedural or technical changes, generally are designed to adapt federal land bank loan service better to the changing needs and conditions of modern farming.

Turning now to the field of non-real estate credit, adjustments have been made here also to the larger amounts of credit needed to finance the greater capital requirements. These requirements are not only for larger

total amounts of non-real estate credit but involve in addition greater amounts of credit for capital purposes. The latter include loans to finance the purchase of machinery, equipment, breeding and dairy stock, farm improvements and similar investments, and generally call for periods of repayment longer than those for loans for seasonal production purposes.

Available data show that the average size of non-real estate loan per farm has increased substantially during the past 10 years and thus reflects the higher production expenses and capital investments. During the decade 1944-54, the average size of loans made by the production credit associations in the United States more than doubled. This was at about the same rate of increase as average production expenses per farm. Such figures as are available indicate that non-real estate loans to farmers made by commercial banks also increased at about the same rate during this period.

Adjustment of credit services to meet the needs of farmers for intermediate-term credit for capital purposes has been the subject of a great deal of discussion during this period. Considering commercial banks first, there is little doubt that they finance substantial amounts of such capital investments, although there are relatively few data available on this subject. It appears that the prevailing practices by banks is to write notes for terms of 1 year or less and renew portions of loans as required in order to provide the longer repayment periods needed for capital financing. Reports indicate that there are occasional notes written for terms of several years. Evidences of interest on the part of banks in improving their credit services to farmers are found in the educational activities of the Agricultural Commission of the American Bankers Association, the federal reserve banks, and many of the land-grant colleges. It is also indicated by the fact that there are over 1,000 men trained in technical agriculture on staffs of commercial banks interested in expanding their farm loan portfolios.

The financing of intermediate-term credit needs has been given much attention in the cooperative Farm Credit System. Over the years, the production credit associations and federal intermediate credit banks have financed very substantial amounts of capital assets. Most of such financing has been handled through the use of annual maturity notes with privileges of renewal of balances in order to provide a longer repayment period. In certain instances such as loans for the purpose of purchasing dairy equipment, the repayment plan calls for monthly payments equivalent to 1/60 of the amount borrowed. Even in these cases the notes have been written with annual maturities in order to make it possible at the end of each year for the borrower and the association jointly to review

the progress being made, revise operating plans if desirable, and to set up a new line of credit for the next year's operations.

Data with respect to the amount of capital financing of this type provided by the Production Credit System are fragmentary. Except where there have been emergency situations, most renewals represent renewals of advances made originally for capital financing. Renewals for the system tend to run between 20 and 25 percent of loans made per year. Two special studies throw some light on the amount of such financing. L. E. Kreider examined 378 loans made in 1950 picked at random from the files of a production credit association in western Kentucky. On the average, 43 percent of the loan proceeds was used to purchase livestock, 13 percent for machinery and equipment, and 5 percent for real estate improvement –a total of 61 percent. In addition, there were renewals of 20 percent.[1]

J. H. Atkinson likewise reviewed the loan experience of 200 members of three production credit associations in the Southern Piedmont who borrowed continuously from 1946 to 1951. In the case of loans to cotton farmers in 1951, for example, 64 percent of loan proceeds was for operations, 16 percent for the investment or capital purposes, and 14 percent for renewal. But on loans to livestock farmers in the same year, only 13 percent was for operating expense, 41 percent for investment, and 42 percent for renewal.[2] These two sample studies provide some indication of the extent of capital financing through production credit association loans.

In an effort better to adjust credit service to this specific need, authority was granted in the fall of 1954 to federal intermediate credit banks to discount, and to production credit associations to write on an experimental basis, notes with terms up to 3 years to those borrowers who preferred such terms to annual maturities. This authority applies only to loans for capital purposes. The term is limited to 3 years since that is the maximum term that federal intermediate credit banks are now legally permitted to discount. The experience with this new authority as it develops may throw further light on this financing problem.

There are some who question whether or not that approach gets at the heart of the problem. The argument is that what is needed is not a longer term note but annual maturities with longer repayment periods. The

---

[1] *Farmers' Needs for Intermediate-Term Credit,* Farm Credit Administration in cooperation with Purdue University Agricultural Experiment Station, Bulletin CR-6, October, 1954.

[2] *Financing Farm Adjustments in the Southern Piedmont,* Farm Credit Administration in cooperation with Purdue University Agricultural Experiment Station; College Experiment Station, University of Georgia; and Farm Credit District of Columbia; Bulletin CR-7, July, 1955.

reasoning is that many borrowers, especially young farmers with more limited capital resources, need more than 3 years to pay for heavy equipment, dairy or breeding stock, major farm improvements, and similar purposes. It has been the experience, however, that the lengthening of the repayment period tends to increase the risk in the loan and the federal intermediate credit banks, therefore, have been more cautious in discounting notes where it appeared that a repayment period in excess of 3 years would be required. This attitude tends to reflect also the provision in the law that limits the term of notes eligible for discount to 3 years.

The belief with respect to the risk increasing with the term is what prompts the view that annual maturities should be retained even though the repayment period is lengthened to 3 years or more. The larger loans necessitated by the expanding capital requirements tend to increase the vulnerability to mistakes and, therefore, call for closer contact by the lender with the borrower and his business. Furthermore, as has been pointed out, management is a particularly important element in the success of modern-day farming. To the extent that credit is based upon the manager's ability, this likewise calls for close checking by the lender. The review of the borrower's progress at the time of the annual maturity of the note provides an effective but relatively inexpensive means of borrower supervision, which seems to be increasingly important under present-day risks.

This reasoning has particular application to young farmers having both limited experience and capital. Their financing risk is generally higher and, therefore, there is greater need for close supervision. One of the byproducts of the high capital requirements of a modern economic size farm is to aggravate the difficulty of a young man starting farming. He, probably more than most other classes of farmers, needs more than 3 years to pay for machinery, cows, and other capital. Notwithstanding these difficulties, production credit associations extend credit to a considerable number of beginning farmers each year. In some instances the associations carry some of these loans in their own portfolios until the accounts become acceptable for discount by the federal intermediate credit banks.

The changing conditions in agriculture that have been discussed have had about the same types of effects upon the credit needs of farmers' cooperatives as upon individual farmers. Cooperatives have needed both larger loans and more credit to finance capital investments. The average size of loans per association made by the 13 banks for cooperatives has increased substantially during the past 10 years. Equally significant is the increase in loans to finance acquisition of facilities. Such credits increased from 15.2 percent of all loans outstanding on December 31, 1945, to 42.5

percent on December 31, 1954. This trend reflects the expanding need for capital investments.

Orientation of Government's Role in Agricultural Credit

The foregoing discussion has dealt with the adjustments in credit service made by the cooperative and other nongovernment or business-type lenders to the changing needs of agriculture.[3] A second broad development has been to define more clearly the government's role in providing agricultural credit services. One phase of this evolution has been to establish more firmly the policy of limiting the use of government credit to special classes of borrowers unable to obtain credit on a reasonable basis from business-type lenders and to disaster or emergency situations. Furthermore, there has been a tendency in such government credit assistance to minimize the use of government funds for making direct loans to borrowers and to rely more on government insurance of loans made by nongovernment lenders. With respect to those credit services offered by the government, the policy has been generally to adapt them to the changes in the situations of farmers referred to in the earlier part of this paper.

One part of this general development of policy has been to speed up the reduction of government assistance to the Farm Credit Administration and the institutions that it supervises and hasten the time when that system would be fully member owned with a minimum of government supervision and control. A number of major steps, some legislative and some administrative, represent substantial progress in this direction during the last decade.

One of the most important of these accomplishments is the substantial repayment of government capital by various institutions in the system. This was begun, of course, more than 10 years ago but the progress during the past decade has been particularly significant. In 1947 the last remaining government capital in the federal land banks was repaid to the U. S. Treasury, making this system completely user-owned. Moreover, in 1949 and 1950, the two revolving funds in which these payments had been held in the Treasury were abolished since it was concluded that

[3] The classification of the institutions under the supervision of the Farm Credit Administration as to their relationship with the government generally presents a problem in view of the capital provided by and their other connections with the federal government. In this discussion they are being considered as nongovernmental lenders because: (1) their loan funds are obtained almost entirely from the private investment market without government guarantee; (2) government capital, assistance and control are being reduced; (3) all operations are on a business-type basis; and (4) elected members are in the majority on the boards of directors of all lending institutions except the Central Bank for Cooperatives and the Federal Farm Mortgage Corporation.

the banks had sufficient resources of their own to meet future requirements and, therefore, no longer needed to depend on the government in this manner.

The production credit associations also rapidly repaid government capital in them (Class A stock) so that as of June 30, 1955, 419 associations, or 84 percent of the total number of 498 associations, were completely free of government capital. The 79 associations still having some government capital had a total of only $2,750,000. This is a substantial reduction from the one-time peak of $90 million of government capital in these associations. In 1954 the banks for cooperatives also repaid $28.5 million of government capital.

From the peak amounts, which occurred at different dates for the various systems, the total repayments of government capital by the federal land banks, the Production Credit System, the federal intermediate credit banks, and the banks for cooperatives aggregated $468 million by June 30, 1955. This total does not include repayments by the Federal Farm Mortgage Corporation which will be referred to later. In addition to repayment of government capital, there was under way during this period a steady program of decentralizing functions from the Washington office to the district institutions and from the district offices to the associations, thus increasing local responsibilities and independence.

Possibly the most significant step in firming-up government policy in these directions was the Farm Credit Act of 1953, which was approved August 6 of that year. This law has as a main purpose to increase "borrower participation in the management, control, and ultimate ownership of the permanent system of agricultural credit made available through institutions operating under the supervision of the Farm Credit Administration. . . ." Specific provisions in this law designed to facilitate these general objectives included:

Creation of a part-time policy-making board (Federal Farm Credit Board) at the Washington level.

Selection of the chief administrative officer, the Governor, by this Board.

Directing the Board within 1 year to make recommendations to the Congress regarding means of carrying into effect the policy stated in the act to the end that the investment of the government in the institutions supervised may be retired.

Encouragement of further decentralization of duties and powers to the associations and increase under stated circumstances the number of the elected members of district farm credit boards.

Under the law, the Farm Credit Administration was taken out of the

Department of Agriculture and again made an independent agency. The former Cooperative Research and Service Division, however, was retained in the Department and is now the Farmer Cooperative Service. With that change, all of the salaries and general expenses of the Farm Credit Administration are now paid by assessment on the farm credit district institutions.

As directed by the law, the new Federal Farm Credit Board carried on intensive studies of ways of expediting the repayment of government capital and on December 8, 1954, submitted a report to the Congress, giving its recommendations. Later bills were introduced (S. 1286 and H.R. 5168) incorporating these recommendations. As passed by the House on July 12, government capital retirement plans were included for only the banks for cooperatives. There will be further study of such plans for the Production Credit System and federal intermediate credit banks.

Related to the policy of reducing government assistance to and increasing the independence of the permanent cooperative Farm Credit System, has been a policy of gradually shifting the non-business type of credit service away from the Farm Credit Administration to the Secretary of Agriculture or the Farmers Home Administration. Any new government farm credit services of an emergency or non-business type nature authorized by the Congress likewise have been assigned directly or indirectly to the Farmers Home Administration.

With respect to the shifts of services from the Farm Credit Administration to the Farmers Home Administration, the first was authorized by the Farmers Home Administration Act of 1946, approved on August 14. This provided that the Farm Security Administration and the Emergency Crop and Feed Loan Division of the Farm Credit Administration be abolished and their assets transferred to the newly created Farmers Home Administration. The lending authorities of the Farmers Home Administration were broadened so that in effect services similar to those previously provided by the emergency crop and feed loans could be continued.

The next shift from the Farm Credit Administration to the Farmers Home Administration was in 1949 when the Regional Agricultural Credit Corporation of Washington, D.C., was dissolved and its assets transferred to the Secretary of Agriculture to be used as a revolving fund for making and servicing disaster loans. The Secretary delegated this function to the Farmers Home Administration.

Another related development has been the ending of the authority to make Land Bank Commissioner loans and the liquidation of the assets of the Federal Farm Mortgage Corporation. While this did not involve any transfer of functions to the Farmers Home Administration, it did

eliminate from the Farm Credit System a lending operation which used government funds and was generally classified as a non-business type. The first step in this process was the expiration of the authority to make commissioner loans in 1947. Liquidation of loans and other assets proceeded thereafter at an increased rate. The sale of the last remaining assets to the federal land banks was authorized by an act of Congress approved on June 1 and was consummated as of June 30, 1955. All but $10,000 of the original capital of $200 million of the Federal Farm Mortgage Corporation has been repaid and in addition dividends totaling $133 million have been paid by the Corporation to the U. S. Treasury. Although proposals have been made from time to time to renew this lending authority, it appears to be the policy of Congress that any similar credit needs in the future will be supplied through the Farmers Home Administration.

These shifts of Farm Credit Administration functions have been a part of the policy of concentrating in the Farmers Home Administration the farm financing services involving the use of government credit. In the development of this policy, several principles seem to have been emphasized. Loans are generally limited to those unable to obtain necessary credit on reasonable terms and conditions from private and cooperative sources. This means in effect that the Farmers Home Administration handles credit risks higher than those acceptable to private and cooperative lenders. Another common feature is that when necessary, borrowers may receive supervisory assistance from the Farmers Home Administration. Preference to veterans is also a frequent requirement. In recent years especially, there has been emphasis on utilizing private funds through loan insurance instead of making direct loans from government funds. Finally, there have been distinct efforts to orient the government credit service to the same changes in agricultural capital requirements and credit needs as have been discussed in connection with the business-type lenders.

Concluding Comments

In summary, two general developments in agricultural credit policies during the past decade are distinctly discernible. In the first of these, private, cooperative and also government lenders have made definite progress in adapting their services to the changing requirements of agriculture. The sizes of loans and the total dollar volume furnished have been enlarged to meet the greater credit needs. With ample and even excessive output, it can hardly be said that lack of credit has been a factor limiting the production of needed farm commodities. Adjustments have been made also in the type of credit service offered. Many lenders have been making special efforts to understand the technological de-

velopments in agriculture and to adapt their loans to the new capital and credit needs.

The second general development has been to redefine the federal government's place in the agricultural credit picture as one of assisting in financing higher risk and emergency situations and to concentrate such efforts in the Farmers Home Administration. One aspect of this policy has been to continue and speed up the retirement of government capital in the cooperative Farm Credit System and reduce government assistance to it in other ways.

It is not practicable in this paper to evaluate these evolutions of agricultural credit policies. Some questions may be raised, however. There seems to be no problem with respect to the adequacy of the total credit supply. Loanable funds flow freely to agriculture from the capital market. The problem area lies rather with the quality of credit service. It is presumed that one goal is to finance those farmers for which farms are or can be made available in a way that enables them to develop efficient and profitable operations under modern farming conditions. This includes financing an annual contingent of desirable young farmers needed to replace older farmers quitting farming.

The building of farms that will earn a good living is likely to call for credit to finance farming adjustments of all kinds—mechanization, enlargement, type-of-farming shifts, soil and water conservation, etc. Such financing generally involves somewhat greater risks than credit for annual production purposes. Historically, there has been and probably will continue to be an undetermined number of both young and established farmers who have particular difficulty in financing needed adjustments. Basic questions are: What is society's responsibility for arranging for the credit needs of this group? Have the business-type lenders gone as far as they can in such financing? How much farther, if any, should government go in providing such higher risk credits? For example, FHA direct and insured loans now represent somewhere around 6 percent of the total farm debt. What may be the optimum proportions of business-type and government credit in attaining the objective stated above? Considering the fact that production is currently more than ample, is there a point beyond which any additional, general easing of credit availability to both young and established farmers would have questionable public advantage because of greater competitive bidding for land and further increases in production?

One final thought will be mentioned. As stated earlier, one effect of the technological advances has been to increase the emphasis on management as a factor of success in farming. This suggests that correspondingly greater attention should be given to the operator himself as a credit

factor. If so, perhaps consideration should be given to the use of credit insurance on the borrower as a protection to both the family and the lender. In this connection it is interesting to note that beginning with January 1, 1955, the Land and Agricultural Bank of South Africa has required every borrower of the bank to carry life insurance equal to the amount of the loan. The premium cost is added to the interest and amortization payments. Also of interest is the fact that the majority of the production credit associations throughout the country are making available and national farm loan associations in one district are getting ready to provide credit life insurance to borrowers who may wish to carry it.

MEASURING RISK IN FARM MORTGAGE LENDING

GEORGE K. BRINEGAR
University of Connecticut

I

MY COMMENTS in this paper are directed toward the question of how to do research in farm mortgage lending rather than to report research results or measurements of risk in farm mortgage lending.[1] In this sense, the title is a bit deceptive and the word "about" should be placed first in the title. By this bit of deception I hope to open up a discussion and to obtain comments on how to make future research in farm mortgage lending more effective from persons who might otherwise not have noticed the subject.

In the effort to obtain your suggestions on needed research in farm mortgage lending three points are presented in this paper as a basis for the discussion. These points when added together are a suggestion for "a next research step" directed toward obtaining information that can be used by borrowers, lenders, and others to calculate the risks associated with the use of farm mortgage credit more adequately than can now be done. They are:

1. The findings of studies in farm mortgage lending concerned with mortgage quality, experience, and risk measurement.
2. Gains that can be realized when these risks are more completely and accurately measured.
3. A research program that would likely enable lenders and borrowers to measure these risks more adequately.

II

There have been many studies of farm mortgage quality and risk. These have been generally successful in measuring farm mortgage risks in terms of the direction of the effect of changes in the risk components, but not in terms of the amounts of these effects. Few would doubt, for example that a portfolio of 25 percent borrower equity mortgages will produce a higher loss rate than one of 90 percent borrower equity mortgages, all other factors the same. On the other hand, existing studies do not tell us how much greater the loss rate would be on the low borrower equity mortgages, than on those with high equities. A sizeable list of risk or quality components in farm mortgage lending can be compiled and in each case, when one of the components is changed, no problem

[1] Appreciation is expressed for assistance and help given in the preparation of this paper by G. H. Moore and R. J. Saulnier of the National Bureau of Economic Research, where the author was on a sabbatical leave.

arises in deciding if more or less risk is involved. The stumbling block is how much more or less risk.[2]

A second type of study bearing on mortgage quality or risk has been widely made. These studies have usually been orientated toward showing how to increase and/or stabilize all or some part of agricultural income. These studies have been directly concerned with such subjects as: crop yields, prices, and insurance; farm management analyses concerning returns to capital, labor, management, and land; and more general analyses concerned with the price level, parity prices, price support programs, etc. This type of study has usually stopped short of developing credit quality implications, though exceptions can be found.

III

The gains that can be realized when mortgage lending risks are more completely and accurately measured are in formal terms, the ones that occur as markets become more nearly perfect and accrue to lenders, borrowers, and the public. These gains are suggested by an examination of farm mortgage lender practices, experience and the farm mortgage.

Prudent farm lending policies and practices are often stated in terms

---

[2] Lawrance A. Jones and David Durand, in their study *Mortgage Lending Experience in Agriculture,* Princeton University Press, 1954, p. 135 ff., presented a summary of nine mortgage experience studies. These materials show that many investigations have reached the same conclusions with reference to measuring ordinally the secondary effects of changes in the terms and conditions under which farm mortgage loans are made on later loss experience. These studies and others also present considerable useful data on cardinal measures of the effects of risk components and thus provide the starting point for further research in this area. They contrast the following studies:

a. F. F. Hill, *An Analysis of the Loaning Operations of the Federal Land Bank of Springfield from its Organization in March, 1917 to May 31, 1929.* Cornell University Agricultural Experiment Station, Bulletin 549, December 1932.
b. E. C. Johnson, *Farm Mortgage Foreclosures in Minnesota,* University of Minnesota Agricultural Experiment Station, Bulletin 293, 1932.
c. Stanley W. Warren, *Results of Farm-Mortgage Financing in Eleven Counties in New York State,* Cornell University Experiment Station Bulletin 726, December 1939.
d. Charles H. Merchant, *Farm Credit in Aroostook County, Maine,* University of Maine Agricultural Experiment Station, Bulletin 418, 1943.
e. E. H. Mereness, *Farm Mortgage Loan Experience in Southeast Alabama,* Alabama Polytechnic Institute Agricultural Experiment Station, Bulletin 242, 1935.
f. Joseph Ackerman and L. J. Norton, *Factors Affecting Sucess of Farm Loans,* University of Illinois Agricultural Experiment Station, Bulletin 468, 1940.
g. Phil S. Eckert and Orlo H. Maughan, *Farm Mortgage Loan Experience in Central Montana,* Montana State Experiment Station, Bulletin 372, June 1939.
h. A. G. Nelson, *Experience of the Federal Land Bank with Loans in Four North Central Iowa Counties, 1917-47.* Unpublished Ph.D. thesis, Iowa State College, 1949.
i. Kermit O. Hanson, *Federal Land Bank Loan Operations in Western Washington, 1917-49.* Unpublished Ph.D. thesis Iowa State College, 1950.

of what types of loans should not be made. These rules frequently exclude loans:[3]

1. Above a certain percentage of the appraised value of the property;
2. In specified areas;
3. Beyond certain periods; and
4. On certain types of farms.

To use such rules decreases the role of price rationing and increases the role of nonprice rationing in the allocation of capital to and within agriculture. The use of nonprice rationing schemes in capital markets causes returns to lenders and borrowers, as well as national income, to be lower than if price rationing were employed.[4] The examples of nonprice rationing rules cited were those usually imposed by lenders. Potential borrowers also impose nonprice rationing schemes on themselves. These self-imposed restrictions may well create a more severe misallocation of resources than the nonprice rationing rules of lenders.

The lending experience of groups providing farm mortgage credit to agriculture suggests that great advances are yet to be made in calculating the risks in farm mortgage lending. The pattern of farm foreclosure rates suggests that something other than the optimum amount and distribution of mortgage credit has been flowing to agriculture. The same conclusion can be reached by looking at cross sectional data. Here the relevant facts are that the net returns to lenders have been significantly different on different types of farm mortgage loans.[5]

---

[3] R. C. Engberg, "Risks in Agricultural Lending," *Journal of Farm Economics*, Vol. 31, No. 1, Part 2, Feb. 1949, p. 602ff.

[4] This statement should be modified to take account of emergency situations and possible differences in the cost of using the price and nonprice rationing schemes. As a matter of fact nonprice rationing schemes appear to be used in agricultural farm mortgage lending largely because of the inability of lenders and borrowers to calculate the right prices to place loans, and of institutional obstacles.

[5] In a study ("Urban Mortgage Lending, Comparative Markets and Experience," J. E. Morton, preliminary manuscript, National Bureau of Economic Research, 1954), the following information is presented concerning the above point, but with reference to urban mortgage lending during the 1920's: ". . . the record does show that differences in contract interest rates as between groups of loans were as often as not the opposite of what would have been necessary to adjust for differences in eventual loss rates. . . . 27 comparisons can be made of differences in interest rates and in loss rates as between pairs of loan categories—15 for life insurance companies and 12 for commercial banks. Among the 27, there were 12 cases in which the differences in contract rates were the opposite of what subsequent experience shows would have been necessary to correct for differences in losses. In 15 cases the differences in contract rates were in the right direction, but for the most part they did not go far enough: 13 were less than what experience eventually showed was necessary, 1 was more than necessary, and only 1 sufficed to equate the realized yields on the two groups of loans being compared. In short, the lenders made the wrong adjustments about as frequently as they made the right ones, and where they made the right ones they almost always failed to go as far as they should."

Gains in addition to those previously mentioned can be expected to accrue as the risks in farm mortgage lending becomes more adequately measured. These gains will be attainable because the contribution of each risk component will be known and the possibility is opened up that these risk components can be (1) spread through insurance, or (2) eliminated.

Some of the risks in farming that are behind farm mortgage risk can be dealt with by existing and new types of insurance. At the present time, the risk of mortgage loss that comes from fire can be adequately handled. In the future the appropriate types of insurance may be developed for crop yields and other risk factors.

Other types of risk in farm mortgage lending are and can be reduced by action at the government policy level. Price support programs for agricultural commodities have in the past caused farm income to be higher and more stable than it otherwise would have been, thus likely decreasing farm mortgage delinquencies.

A third avenue of reducing farm mortgage risks can be made even more effective than it is at the present time when the risk components in farm mortgage lending are more adequately measured. The farm management advisor and researcher will be able to focus attention directly to methods of eliminating the risk components that contribute most significantly to mortgage trouble, and aid farmers to eliminate these components from their operations. Farm enterprise reorganization measures to reduce risks to borrowers and lenders include a wide range of possibilities, extending from simple adjustments in operating techniques to what amounts to a virtual rebuilding of farms. An interesting feature of the problem of eliminating high lending risk farming units is the failure of high farm labor mobility to neecssarily result in the elimination of these farming units.[6] By states the rate of labor movement out of agricultural employment (number of persons moving out of agricultural employment from 1940 to 1950, minus number moving in agricultural employment from nonfarm occupations) was not highly correlated with the change (decrease, 1940-1950) in the number of persons employed ($r^2 = +.28$ with 46 degrees of freedom).[7] This low correlation is a consequence of the variation among states in the growth of farm population. A high r^2 in this study would indicate a close relationship between (1) the rate of movement out of agricultural employment and (2)

---

[6] High lending risk farming unit as used in this context is defined as a low income farming unit.

[7] Charles H. Berry, Yale University, "Farm Labor Mobility," unpublished manuscript.

the decrease in agricultural employment and elimination of low-income high-lending-risk farming units.

IV

A properly designed research program offers promise of enabling lenders and borrowers to measure more adequately some of the risks in farm mortgage lending. Such a study would be designed to show how much the actuarial worths of farm mortgages differ under alternative provisions of the mortgage contract, and the situations of borrowers with reference to funds that are and will be available to service their debts.

The decision to use an actuarial worth concept in a study of this type rather than a market clearing price or some other concept flows (1) from the simplicity of the concept, and (2) from the ease of application of any findings. The actuarial worth concept in this context has its usual meaning, as when it is used in games of chance. The transition from measurements in actuarial worth terms to policy is relatively direct. The borrower, for example, must decide at what percentages of the actuarial worths of his several alternatives he will be willing to borrow as would the lender, but with reference to lending.[8] This degree of simplification in the decision-making process would likely be much more useful to a lender making large numbers of loans than to the lender making a single loan or to a single borrower. At a government policy level, measurements of risk in terms of actuarial worth are useful because the jump to national income maximizing prices is relatively small. This jump is small because national income maximizing prices are equal to actuarial worths minus cost of spreading the risk.

A research program designed to throw light on these questions would consist of three parts. One part would consist of an analytical scheme for systematically using the data on farm mortgage lending and quality. A second and the most costly part of the study would consist of fitting existing and collecting new data into an analytical scheme. A third part would consist of testing and retesting the analytical scheme and data making such revisions and new collections of data as seem worth-while.

The requirements of the analytical scheme

The analytical scheme must be designed in such a way that three types of information can be readily taken into account, consisting of (1) completely determined magnitudes, (2) probabilistic information, and (3) informed estimates. This scheme of analysis differs from the ones now

[8] For the moment we are assuming actuarial worths have been exactly calculated, which will never quite be the case.

used by lenders, borrowers and researchers—sometimes consciously and some unconsciously—in that (1) probabilistic information would be explicitly dealt with rather than handled along with information of the third type, (2) relevent information would be organized systematically with reference to risk measurement, which would facilitate learning from past experience, and (3) the central effort would be to determine how much each risk component underlying the farm mortgage contributed to the later history of the mortgage.

The following specific problem is presented to illustrate the types of questions that the study would be designed to enable lenders and borrowers to handle:

1. Question:
   How much more would be the actuarial worth of a portfolio of mortgages if the funds that the borrower used to service his mortgage were obtained in:
   A. An amount of $2,000 in each year (equal to 10 percent of the value of the farm) than if these funds were obtained by the borrower in a pattern in which
   B. Any amount might be received in any one year falling between +$10,000 and −$6,000 (equal to +50 and −30 percent of the value of the farm) with equal chances that in any one year the amount would be equal to +50%, +49% . . . −29%, −30% of the value of the farm.
2. Additionally assume:
   A. As given, a mortgage contract with the following provisitns and data:
      (1) a 20-year fully unamortized contract carrying a 4 percent interest charge.
      (2) a $10,000 loan amount equal to 50 percent of the value of the farm.
      (3) that the mortgage will be foreclosed if interest payments become delinquent by more than three years.
   B. That the amount of funds that will be available to service the mortgage over the twenty-year period will be equal on the average for a large number of farms to $2,000 per year or 10 percent of the value of the farm.

For the sake of brevity, in the illustration, a highly simplified example-type problem was used. The method used would need to be sufficiently flexible so that most any assumption (facts when available) could be made about: (1) the mortgage contract (including such items as interest; amortization; period of loan; cost of originating; servicing; foreclosure;

etc.) and (2) the amounts and patterns in which funds are and will be obtained to service the mortgage (including outside resources; crop yields, their trends, and variances; prices; costs; management; honesty of borrower; etc.).

The research procedure to be followed in this proposed study will differ somewhat from that of many past studies of farm mortgage risks. In this case probabilistic models will be initially established, then tested, and later refined in the effort to increase their predictive efficiency. The procedure contrasts with the usual procedure of collecting the data and specifying the relationships that were found between farm and/or farm mortgage characteristics and later mortgage experience. This suggested procedure does not exclude any of the types of findings that have been made in past studies but does offer a better hope of obtaining additional findings—the quantitative importance of at least some risk factors in farm mortgage lending. The suggested procedure has the apparent disadvantage of requiring the researcher to have available considerable amounts of information on farm mortgage risk before the study is started. This apparent disadvantage is however an advantage. Sufficient information is available and can be obtained from existing sources to construct useful models. If this procedure were followed, the study would be starting where some others have left off rather than starting from scratch.

The data

All of the data that can be used to study farm mortgage quality, and also risk measurement in farm mortgage lending when the data are properly collected and organized, fall into two classes. These materials concern (1) the provisions of the mortgage contract and (2) the funds that will be available to service the mortgage.

In going behind the terms of the mortgage contract to determine the effects on mortgage quality or risk, of changes in the mortgage contract, assuming away the funds problem, is the question of interdependence among risk or quality components. At the moment it is an open question whether or not a simple addition of these effects is equal to their combined effect when these factors exist together. For example, would the total losses to a mortgage lender be affected (equal to, more than, or less than otherwise) if distribution of a given number of risk elements in a portfolio of mortgages were shifted among the mortgages in the portfolio. This type of interdependence may also be found to exist between mortgage contract terms and the funds to be used to service a mortgage. Will a farmer, for example, with little equity in his farm work more or less hard to keep up his payments than the farmer with a high equity in his property?

When an effort is made to go behind the question of the funds that will be available to service the mortgage, problems in addition to that of interdependence arise. Not the least of these result from the great variety of factors that effect the productivity of capital and the amounts of funds that will be used to service a mortgage. Some of these items consist of crop yields, prices of output, prices paid, management, cost of credit, land prices, etc. Some of these magnitudes can be determined exactly, some in probability terms and some will remain in the estimate class.

The purpose of collecting data with reference to farm mortgage lending will be to determine the quantitative importance of as many risk components or quality factors, individually and in combination, as is possible and to reduce the areas of estimates to probabilities or certainties and the areas of probabilities to certainties.

Testing the materials

One of the advantages of a mortgage quality study organized on the lines described above is the ease with which the findings can be tested and refined. This advantage comes from the fact that predictions of loan experience can be made at various levels of aggregation and then compared with the past experience of various lenders. As more information becomes available the degree of aggregation can be lowered and the results again tested. Thus, the stage is set for continuing refinement in the measurement of risk in farm mortgage lending.

One of the first tests to apply at a high level of aggregation would consist of the analogue to the illustration presented earlier. Here an attempt would be made to explain differences in loan experience (1) among different types of mortgage contracts where income patterns were the same and (2) among the same types of mortgages where the income patterns were different. The level of aggregation used would determine variation among mortgage contracts that were treated as if they were the same as would be the case in classifying farms into similar income groups. As increased amounts of data became available the levels of aggregation would be reduced and more exact differences in risk could be calculated among various classes of loans. This refinement process could be continued until meaningful classes of mortgage risks could no longer be identified. Different prices for farm loans could then be charged, in accord with the amount of risk involved, increasing the perfection of the farm mortgage market.[9] The variations in mortgage

[9] This assumes that institutional obstacles can be overcome. Significant gains could be realized even if these obstacles were not overcome by each lender at the mortgage origination level. Gains would result if lenders became more specialized with reference to the amounts of risk they took, if these risks were reflected in secondary markets, and if borrowers could more accurately know the risks they were assuming.

charges that could be made, when significantly different risk classes are identified, would be analogous to the differences in the prices that are in effect when life insurance is purchased by different age groups, and for types of coverages, etc.

V

Examination of the risk problem in farm mortgage lending indicates that success has been achieved in the past in measuring mortgage quality, or risk components, in ordinal terms. The next step appears to be to extend these studies by probing deeper to get at cardinal measurements. Success in this effort would lead to a more perfect mortgage market, thus increasing national income as well as the incomes of lenders and borrowers.

Before closing, a word of caution must be emphasized. A large part of successful farm mortgage borrowing and lending is an art—it will always remain an art—the artist's contribution will remain great. The best research can hope to do is to give the farm appraiser, manager and the policy maker a few, more adequate tools. In this paper an attempt has been made to suggest a research procedure that would likely result in the development of some of these tools.[10] This research procedure was suggested in the effort to obtain suggestions and critical comments on the most needed types of farm mortgage research.

[10] The feasibility of a study of this type is suggested by (1) the availability of a limited amount of cardinal measurements made in past farm mortgage studies, and (2) by the National Bureau studies of (a) urban mortgage experience and (b) corporate bond experience, in which considerable success has been realized in obtaining such cardinal measures.

INFLUENCE OF TRADE CREDIT ON BROILER PRODUCTION*

JOHN O. GERALD
Agricultural Marketing Service

TRADE credit has long been widely used by broiler growers.[1] Also, if we assume trade credit to mean the placing of supplies and services at the disposal of broiler growers without immediate cash payment, practically all broiler growers use trade credit. For example, 95 percent or more of all growers in Georgia, Mississippi, South Carolina, and Virginia in 1952 used trade credit.[2] The 1954 production of one billion broilers was largely financed with trade credit for out-of-pocket costs.

In my opinion, the following characteristics of broiler production and of broiler growers gave rise to this extensive use of trade credit:

1. Feed accounts for roughly 65 percent of total production costs. Out-of-pocket costs are approximately 90 percent of all costs.
2. Broilers are usually on feed for about 75 days or less. One fourth of out-of-pocket costs are incurred during the first week; 38 percent during the next 6 weeks; and 37 percent during the last 3 weeks.
3. Market uncertainties, particularly price uncertainties, and production risks are large.
4. Few liquid assets were available to many potential broiler growers for starting new enterprises, and many of them were averse to mortgaging their farms. Their former acquaintance with the one-crop system of farming had not equipped them to look for or recognize the opportunities awaiting them in broiler production.

With these characteristics of broiler production and broiler growers, potential lenders would first have to convince growers that opportunities awaited them. Then, as lenders, they would have to depend primarily upon the income from broilers to repay the debts. This would require retaining some of the income from profitable flocks to cover losses on others.

---

* The views expressed here are my own and not necessarily those of AMS. They were obtained through contacts with various segments of the broiler industry; from the findings of research studies with which I have been connected; and from a review of the extensive literature dealing with producing, marketing, and financing broilers. My contacts have been primarily in Southeastern areas, and the influences that I describe have probably been more evident in Southern areas than in other areas.

[1] R. O. Bausman, *An Economic Survey of the Broiler Industry in Delmarva*, University of Delaware Agricultural Experiment Station Bulletin 242, March 1943, p. 48.
W. D. Termohlen, *et al.*, *An Economic Survey of the Commercial Broiler Industry*, USDA Agricultural Adjustment Administration, G-61. 1936, p. 4.
And other publications.

[2] C. K. Laurent, *et al.*, *Financing Production and Marketing of Broilers in the South, Part I: Dealer Phase*, Southern Cooperative Series, Bulletin 38, June 1954, p. 33.

Most banks and other conventional lending institutions apparently have preferred not to finance broiler growers directly, except for those on which the risk could be covered under normal interest rates. Many growers have been reluctant to secure loans with real estate or other property satisfactory to conventional lending institutions.

Feed dealers stepped into the credit picture in some areas where the above conditions existed. Feed dealers discovered early in certain areas that broiler production provided a profitable outlet for their supplies. They further discovered that they could expand sales by providing broiler production supplies on credit to independent farmers. This caused them to promote the broiler business to large numbers of growers.

Feed dealers were not averse to charging what appears to be high interest rates, although the growers received a bundle of services for these charges. Dealers could do this by adding the costs of interest, risks, and uncertainties to the prices of their supplies. These charges did not prevent new growers from entering production for a long time.

However, cost-price relationships have not remained stable throughout the history of the broiler industry. Disease outbreaks at times have been extremely costly. Marketing methods have become outmoded and have had to be overhauled. Prices of competing products have changed. Economies of scale have become effective for many dealers, growers and others, and economies external to the firm have come about. Each new development has brought about pressures from growers or dealers for a redistribution of the risks of loss and/or benefits of profits from their broiler-growing activities. Whatever the source of the pressure, we can be sure of our facts when we report that redistributions have occurred frequently.

The financing plan has become the thread upon which hangs the distribution of risks, income, and authority between dealers and growers. In my opinion it is the primary basis of competition among dealers for growers and the most important factor to be considered by growers in selecting dealers.

Open Account. Early publications about broiler production mentioned the use of trade credit by broiler growers for feed on open account. Farmers usually fed some home-grown feed, paid cash for the baby chicks, litter, medicine, and fuel, and provided supervision and marketing services for themselves.

The development of financing of both baby chicks and mixed feeds by feed dealers and hatcheries probably began around 1930.[3] Only to the

[3] C. C. Cable, Jr., *Growth of the Arkansas Broiler Industry*, Arkansas Agricultural Experiment Station Bulletin 520, April 1952, p. 8.

extent that dealers failed to require adequate security were they bearing risks. They assured themselves of desired returns through prices charged for their merchandise.

Modified Open Account. We still have in use today a financing plan called open account. However, this has been modified considerably by verbal statements and industry practice. The more common modifying clauses are no loss to the grower, dealer supervision of production, and dealer marketing.

Share Plans. Early share arrangements specified the proportion of any profits over booked costs that each party would receive, usually 90, 80 or 75 percent to the grower. Dealers usually accepted all losses, and dealers' records were final. Growers subordinated their 10-15 percent of costs to booked accounts of the dealers, excepting that portion of gross returns that were considered perquisites of the growers. This included a return for empty feed sacks, a potential value for manure, and home use of the broilers. These items potentialy covered the fixed costs of growers.

Recently, share arrangements have been quite varied. Under some share plans, dealers pay a house rental fee and receive 50 percent or more of the net returns above the wholesale costs of the supplies and house rent. Others merely give the grower 50 percent or more of the net returns above wholesale cost of the supplies. Still others give growers a fixed rate per unit sold or started, or a rate to be determined by the efficiency of the grower, plus some share of the net proceeds.

Fee Plans. In the past, fee plans provided that the feed dealer would pay to the grower a flat payment per unit started or per unit sold. These plans provided the grower with a joint return for his facilities and labor, but provided relatively little incentive to the grower to perform efficiently.

Feed conversion plans at first provided a sliding scale of payments to the grower depending upon his efficiency in converting feed into meat. These gave way recently to plans that take into account the weight of the birds when sold and the mortality record. This was a logical step since basic feed conversion plans provided growers with little incentive to hold down mortality losses during the first few weeks. Also, since feed conversion declines as the birds advance in age, basic feed conversion plans result in conflict between dealer and grower over the question of when to market. Some recent innovations have even placed one-half of the market uncertainties on growers under feed conversion plans.[4]

House Rental Plans. Growers under house rental plans are landlords who cash rent their facilities, and usually they are the laborers also. Dealers who are the cash renters bear all of the risks and uncertainties

[4] *The Broiler Industry—In Georgia and Other Southern States,* Virginia Department of Agriculture, Division of Markets, Richmond, June 1, 1955, p. 3.

of the broiler enterprises, except those associated with the long-run returns on fixed facilities.

No one plan is used exclusively in a given area or at a given time, nor are the provisions of any one plan standardized among growers or dealers. For example, there were three basic plans in use in Georgia during the first half of 1952, but several variations were found in the provisions of each plan.[5] Most dealers were using more than one plan at the time. However, a survey in September 1954 indicated that Georgia feed dealers had become the entrepreneurs for a major part of all broiler output.[6] Verbal reports indicate similar conditions in several other areas.

In view of this steady evolution in what we call trade credit, it seems desirable to investigate its influences on various aspects of broiler production.

Feed Dealer-Grower Relationships

Most broiler growers furnish housing, equipment, litter, utilities, and labor to the broiler enterprise irrespective of the financing plan. Labor represents approximately half of the grower's contribution. Feed dealers contribute approximately 85 percent of the total costs. Dealers inspect facilities before placing chicks, decide how many chicks to place, decree certain management practices, supervise growing operations, make the marketing decisions and negotiate the sales of birds, and pay growers according to the plans under which the broilers are grown. Some contracts specify that the grower is not a partner of the dealer and that the grower does not have a bailee's lien on the chickens. All contracts specify that title to the birds is vested in the dealer, and that the grower will be remunerated for his services according to the terms of the contract.

The control that feed dealers have over a large part of the broiler industry has resulted in a form of horizontal integration. This gives dealers an opportunity to perform services for broiler growers in addition to supplying production items. Further, feed dealers can form business agreements with other firms servicing the broiler industry. This in many cases has resulted in vertical integration. Whether this system constitutes tenant farming, sharecropping, labor hiring, or integration by common agreement is hard to decide.

Size of the Broiler Enterprise

There is little doubt that trade credit has influenced the size of the broiler-growing unit. Four reasons for this influence can be found: (1) desire of feed dealers to expand sales; (2) economies to the feed dealer

[5] O. C. Hester and W. W. Harper, *The Function of Feed Dealer Suppliers in Marketing Georgia Broilers*, Georgia Agricultural Experiment Station Bulletin 283, August 1953, p. 19.

[6] Survey by Market Organization and Costs Branch, AMS.

in servicing and marketing large flocks; (3) desire of growers to use available labor more fully; and (4) economies to the grower in providing facilities and services for large flocks.

Probably the most important economy to the feed dealer in large broiler-growing units is in delivering a load of feed at a time or in picking up broilers. These economies are sufficient reason for dealers to influence growers to operate units that would yield a truckload or multiples thereof. Ninety-six percent of all dealers interviewed in Virginia in 1953 had a definite preference as to size of flocks to supply.[7]

Other aspects of efficiency from the dealer's viewpoint include accounting, supervision, financing inventories, scheduling receipts, disbursements, and marketings.

However, the most important reason in the past for dealers to push for larger growing units has undoubtedly been their desire to sell more feed and supplies. This ties in with the financial ability of growers to increase scale. As cost-price spreads narrowed, dealers found it necessary to assume the risks and uncertainties of the broiler enterprise in order to increase sales, and growers were still able and willing to install more house capacity as they were relieved of risks. There are indications that labor requirements per 1,000 birds decrease rapidly as flock sizes increase. Cost of facilities also shows some decline per unit as sizes go up.

Ease of Entry into Production

Trade credit has made it easier for farmers to begin growing broilers, but has it been too easy? What equity does the grower risk, and how is it ventured?

Of 220 growers surveyed in Mississippi in 1952, 82 borrowed to finance the construction of houses and 79 borrowed to finance the equipment. These investments averaged 31 percent of total capital required.[8] Only 17 of 100 growers interviewed in South Carolina borrowed to finance houses and 28 borrowed to finance equipment. Original investment averaged 45 percent of total capital required.[9] Also, my impression is that the majority of growers in other Southern areas have not borrowed to cover their fixed investment, although Louisana is a known exception.[10]

---

[7] J. T. Buck, *An Evaluation of Broiler Financing Methods in Virginia*, Virginia Agricultural Experiment Station Bulletin 470, October 1954. p. 19.

[8] W. E. Christian and P. T. Blair, *Broiler Production, Financing and Marketing in Mississippi*, Mississippi Agricultural Experiment Station Bulletin 514, March 1954, pp. 20-21.

[9] J. F. Miles and J. V. Minchew, *Broiler Production in South Carolina with Emphasis on Methods of Financing*, South Carolina Agricultural Experiment Station Bulletin 415, January 1954, pp. 24-27.

[10] E. P. Roy and J. M. Baker, *The Broiler Enterprise in Louisiana*, Louisiana Agricultural Experiment Station Bulletin 475, June 1953, p. 9.

One financing plan was noted in Georgia under which feed dealers would construct and equip houses for new growers, share the profits from a stated number of lots, and then release the grower to choose any dealer and plan he desired.[11] However, a survey of 200 growers randomly sampled failed to reveal any growers who had used that plan.[12] In general, growers apparently provided fixed facilities with little or no backing from feed dealers.

Despite the gap in our information on this point, let us assume that most growers had equities in their broiler enterprises ranging from 30 percent to 50 percent or more of total capital requirements. However, growers under the more common plans have not risked their equities in recent years. Therefore, once in production they potentially stay in.

Efficiency of Growing Operation

The wide experience and knowledge of broiler production on the part of feed dealers has undoubtedly provided a means whereby broiler growers could increase their efficiency. There is much evidence that growers value highly this experience of dealers. As an indication of the importance of dealers' knowledge of good management practices, almost one half of all surveyed dealers in Virginia stated that they were willing to finance new growers because such growers were quite willing to follow the dealers' instructions. This group of dealers found that new growers often raised broilers for lowest cost.[13]

In practically all cases, dealers make the important management decisions: floor, water and feeder space per chick; breed and source of chicks; types of feed; disease prevention and cure; feeding routine; litter practice; ventilation; etc. Diagnosis and treatment of disease by the financed grower without dealer knowledge and advice is usually considered sufficient cause for dropping.

Now let us look at what has happened to physical efficiency of broiler growing. In 1941-42, broiler growers in Sussex County, Delaware, raised 3-pound broilers in 13-16 weeks with an average mortality of about 13 percent. Today such birds are grown in 9-11 weeks with a mortality of 7 percent or less. Dealers are aware that floor space per chick is an important factor in mortality and the decision as to floor space is usually made by the dealers.

As late as 1947-48, feed conversion for 3-pound birds was over 4 pounds of feed per pound of meat. Today the average in Georgia is about 2.8 pounds,[14] and it is not unusual for a grower to average 2.6. This decline in

[11] W. W. Harper, *Op. cit.*, p. 19.
[12] *Ibid.*, p. 22.
[13] J. T. Buck, *Op. cit.*, p. 18.
[14] Virginia Department of Agriculture, Division of Markets, *op. cit.*, p. 2.

feed consumption is due to several factors: better disease contrtl with lower mortality; improvements in breeding; better feed and feeding methods; and a shorter period of time during which the birds must burn energy for maintenance of life. Information on those practices and products conducive to better feed conversion was obtained by growers through feed dealers.

The average time in West Virginia in 1945 for growers raising 3 broods of 3,000 birds per year was 70 hours per 1,000 birds started. It has been estimated that in 1951 one man could take care of 15,000 birds.[15] One man can now raise four lots of 30,000 broilers in a year. This results in an average of less than 25 hours per 1,000 birds started.

Fixed capital efficiency has increased along with fuller year round use, a shorter production period, and lower mortality.

Quality and Standardization of Production

The financial interests of dealers in broiler growing has given them reason to pry into technical production problems, and to attempt to provide the best production items and management advice to their growers. Competition for the patronage of dealers has been rigorous, and has possibly eliminated many of the less reliable and less efficient supply firms from broiler areas.

As was pointed out earlier, dealers decree that certain management practices are to be followed. For seeing that these are carried out, dealers hire servicemen who visit all growers weekly or more often. Growers know that their efficiency, cooperativeness, and honesty directly affect their returns and their ability to obtain better terms in their next plan. Such a system probably produces a highly standardized product.

One indication of a standardized product is that Georgia processors usually take entire houses of birds, and slaughter them with no in-plant finish-feeding. Daily purchase records for 1954 for 10 processing plants in North Georgia show that an average of 89 percent of live birds were bought within a one-cent price range.[16] There were large discounts on some flocks. In turn, a few processors in North Georgia estimated that more than 90 percent of all broilers purchased by them moved out as unofficial Grade A.[17]

Unless most shipments met the buyers' requirements, I believe that processors in the largest and fastest-growing broiler area of the United States would have taken steps by now to correct the situation.

---

[15] C. C. Cable, Jr., *Op. cit.*, p. 12.
[16] Records obtained by Market Organization and Costs Branch, AMS.
[17] Virginia Department of Agriculture, Division of Markets, *Op. cit.*, p. 7.

Costs of Production

Production of broilers by feed dealers has probably lowered the costs of producing broilers under that of individual grower initiative, even assuming that noted improvements in supplies and efficiency would have occurred. Dealers are in a position to take advantage of wholesale prices on supplies. Their commitments to hatcheries, feed mills, and other allied interests reduce the uncertainties and costs of those firms. Dealers' promotion of broiler production has increased the density of production in some areas. This in turn has brought about efficient delivery, pickup, and service operation.

Broiler Marketing

Financed broiler growers do not market broilers, as a general rule. Dealers make the decisions "when to sell," "where to sell," "to whom to sell," and "the price to accept." Furthermore, they carry out these decisions with no assistance from growers. Under favorable price outlook-cost conditions, they may yield to growers' wishes on these matters, but this does not affect their right to act.

Their right over financed flocks derive from the terms of their liens on the enterprises or ownership. Their abilities have developed from marketing broilers under almost all conceivable supply-demand conditions and from their daily contacts with all segments of the industry. The benefits derived from the greater bargaining power of dealers as compared with individual growers probably outweigh those derived from dealers' specialized marketing knowledge and contacts. The typical processor in Georgia finds himself faced with the problem of buying from only 5 or 6 dealers rather than from 500 growers or more. The loss of one account is magnified 100 times. In addition, dealers usually reside in town and are personally acquainted with processors.

Efficiencies of marketing also result from dealer control of marketing. Scheduling of deliveries to processing plants prevents slow downs or stoppages of plant operations and long delays in unloading of the cooped birds. This eases the job of labor organization for the plant manager and reduces farm-to-plant shrinkage in the live broilers. The costs of communications between seller and buyer are also reduced by this concentration of decision-making powers.

Such a system also can easily react to incentives for special characteristics. A large order from a buyer for special weights will prompt a feed dealer to provide these weights, provided the request carries with it the assurance that the small extra costs involved are covered. The channeling of this order to individual growers through equivalent price incentives would not be guaranteed delivery.

In many cases, dealer control and responsibility for marketing has led to vertical integration. In other cases, business agreements between the feed dealer and processor have given independent firms the benefits of integration. Dealers tie in with certain outlets to take all or a given quantity of their output. This is another case of reduction of risks. These tie-in agreements usually specify the method of price determination and some consider this to weaken competition. However, this method of doing business is not original to the broiler industry.

Stability in Production and Price

Many people have raised questions concerning the influence of trade credit or trade financing of broiler production on the stability of the industry. I do not pretend to know all the answers to such questions, but there are a few points that can be made.

1. Trade financing has resulted in a trend toward vertical integration. This, in turn, has resulted in a more inelastic production-response curve for broilers, hence less variation in placements, than would occur with independent initiative in all segments of the industry, assuming an inadequate basis for the measurement and equalization of the external interdependence of the different segments of the industry.[18] This effect is indicated by a coefficient of variation for 1954 weekly placements in Georgia of 10 as compared with 16 in Delmarva where integration is less developed. We must assume equality of information concerning outlook in making the above comparison.
2. Due to seasonal and shorter-run variation in demand for chicken meat, an inelastic *supply* curve for the broiler industry would produce instability in prices. However, it is not possible to demonstrate comparatively the effects of vertical integration on prices because there is interdependence of price among areas and because production response is not necessarily the same as supply response. Storage may be a low-cost means for integrations to develop an elastic supply curve from an inelastic production-response curve.

Appraisal

Trade credit to broiler growers has gone through an evolution and has carried the industry in some areas along with it. Growers now have the alternative of selling their labor and renting their facilities to feed dealers, or of using these for their own account. This latter alternative apparently has not been an attractive one to growers recently because of low prices.

[18] See W. W. McPherson, "The Firm and Interdependence Among Firms," *Journal of Farm Economics*, Feb. 1954, pp. 139-143.

At the same time, dealers in those areas have continued to fill many houses with broilers either for their account or for joint accounts.

The activities of dealers in purchasing supplies, hiring labor and facilities, and organizing them for the production process has undoubtedly resulted in a lower cost product. Whether proper returns were made to each of the items of production has not been determined. Whether the status of growers changed for better or worse remains undetermined also. We can only conclude that dealers were better equipped than growers to assume the risks and uncertainties of broiler production, and that they reacted in the right direction to these responsibilities. This reaction provided gainful employment to large numbers of people in areas where economic alternatives were limited. This employment was not restricted to farm people alone. Dealers employed many persons to aid them in organizing and servicing broiler-growing operations. Allied interests such as feed mills and hatcheries increased their payrolls. Broiler processing firms engaged large numbers to assemble, dress and completely eviscerate, and pack the hundreds of millions of broilers marketed from the areas.

There are more unanswered questions concerning the results of the things we have called trade credit. One of these concerns the level of competition within areas; another is the stability of the "new" broiler industry; another, long-run results of competition among areas. Specialists from the Virginia Division of Markets concluded from their study of the broiler industry in Georgia and other southern states that the Virginia broiler industry must change its methods of business operations or suffer loss. Their conclusions read:

> In light of what has happened and is still happening in the broiler industries to the South of Virginia, where do we in Virginia stand? Competition from these areas has already made serious inroads in the Virginia industry. Efficiencies affected in Georgia, North Carolina, and Alabama enable the industries in those States to undersell the Virginia industry even in home markets *in spite of the fact that Virginia has as good a chick, as good a quality feed, and as good a poultryman.* The main difference lies in the method of operation and *not* the quality of chicks, feed, or management.[19]

[19] Virginia Department of Agriculture, Division of Markets, *Op. cit.*, p. 13.

DISCUSSION: REORIENTATION OF POLICIES IN AGRICULTURAL FINANCING

ERNEST T. BAUGHMAN
Federal Reserve Bank of Chicago

The paper by R. C. Engberg concludes, among other things, that loanable funds flow freely to agriculture, that the supply of agricultural credit generally is adequate, that lenders have made definite progress in adapting their credit

services to the changing needs of agriculture, and that the problem area, insofar as one exists, lies with the *quality* of credit service rather than with the general availability of credit. This discussant has no quarrel with either the general framework within which the subject is discussed or with the specific conclusions reached. Although the topic has many ramifications, it is held within appropriate limits and is treated in a logical manner. A number of the points raised "along the way," however, seem to merit additional exploration, and a few points that merit attention have been omitted, no doubt in the interest of brevity.

The major point meriting additional comment pertains to the growing need for intermediate term credit—credit of a term somewhat longer than the usual nonreal estate loan and shorter than the typical real estate loan. Problems encountered in providing this type of credit service are discussed briefly, but the question of whether the adequate provision of such credit requires that loans be written at the outset for the full period over which they are to be repaid is not resolved. The paper appears to favor the use of annual maturity notes with privileges of renewal of balances and observes that this practice is in quite general use by commercial banks and production credit associations.[1] The lack of resolution of this question may be due in part to the fact that the discussion is cast in terms of non-real estate loans. No reference is made to the possibility of providing a substantial amount of intermediate term credit by using real estate mortgages as the credit instrument.

With total farm mortgage debt equal to only about 9 percent of the current value of farm real estate, about 70 percent of the nation's farms free of real estate debt, and only one out of ten having mortgage debt in excess of 40 percent of its value (1949), the opportunities of adapting farm real estate loans to the provision of intermediate term credit would seem to be great. Especially is this true for the financing of many types of capital investments that legally become a part of the real estate once the improvement is made—drainage, water supply, land leveling, basic lime and fertilizer applications, terraces, fences, buildings, and the like. But the possible uses of real estate mortgages as an appropriate instrument for the provision of intermediate term credit service to agriculture need not be limited to the financing of these kinds of projects. Basic lines of machinery and foundation herds of cattle, for example, could be and sometimes are financed in this way. Furthermore, this method of financing may be adapted also to the service of recurring needs for short-term loans. The provision of lines of credit on a more or less permanent or continuing basis in which borrowers are authorized to draw up to some predetermined maximum at such times as funds are needed may prove to be both convenient and economical. Such arrangements would require some type of overriding credit instrument, possibly an open-end real estate mortgage, but should have the advantage of incurring less expense and inconvenience than the making of a series of individual notes, each secured, for example, by a chattel mortgage.

A beneficial effect of the growing need for intermediate term credit is that

[1] It is reported, for example, that loan renewals in the production credit associations average between 20 and 25 percent of loans made per year. Comparable data for commercial banks are not available, but it is known that the renewal and/or extension of loans beyond their original due dates is quite common. Surveys of a group of midwest banks indicate that renewals and/or extension of nonreal estate farm loans in several recent months, have amounted to about 10 percent of average outstandings of such loans.

it has helped to focus attention on the total capital requirements of the farm business and, therefore, on its overall credit needs. In doing this it brings us to grips with the central problem of agricultural finance, namely to provide arrangements whereby capable farm managers can obtain access to enough capital so as to employ their managerial and labor resources effectively. It may be feasible no longer to think of agricultural credit largely in terms (1) of long-term farm real estate loans to fiance the purchase of land and "permanent" improvements and (2) of short-term (production) credit to finance annual and seasonal needs for crop and livestock production. The entire farm business must be financed, and all the farm resources can well be considered available to back up the credit line. After all, farm debt must be serviced from the total income of the farm family. Attempts to identify the income from individual farm enterprises with individual segments of farm debt probably hinder rather than aid in the development and execution of the best management plans for farms.[2]

Carried a step further, this line of thought suggests the development of what may be described as "one-stop credit stations"—agricultural lenders equipped to provide a line or lines of credit adequate for *all* the credit needs of individual farms. There is some evidence that the more forward looking commercial banks and life insurance companies are beginning to think in these terms. And it is not inconceivable that the Farm Credit Administration will go through another basic reorganization within the next decade at which time its real estate and production credit facilities will be merged. It probably should be an accomplished fact at this time. For commercial banks the adoption of this view would require a substantial reorientation of thought relative to the appropriate role of correspondents and possibly of the discount facilities of the Federal Reserve System.

If "one-stop credit" becomes the common practice in agricultural finance, it will make it somewhat easier for lenders to give greater weight to their estimates of managerial capacity of borrowers and the total debt-carrying capacity of farms when establishing credit lines. Also it would simplify the adaptation of life and other types of insurance to the spreading of risk inherent in debt. However, a very high order of credit service would be called for, and the agricultural specialists now found on the staffs of a growing number of financial institutions probably would find their areas of responsibility and possible service to be expanded materially.

How far should commercial lenders go in hitching together farm management and credit? Many lenders state that they do not intend to get into a position of participating in the management decisions of their customers. Agricultural specialists on their staffs are viewed as technicians who can do a good job of appraising the management skill and operational plans of prospective borrowers, detect possible difficulties at an early stage and suggest remedial action, and, in some instances, can help get new capital investment channeled

[2] Credit practices developed as selling aids by many manufacturers and merchandisers of farm equipment and supplies tend toward a further fragmentation of the sources of credit used in agriculture and make it more difficult for individual lenders to accurately appraise the soundness of credit lines. This condition tends also to perpetuate a heavy reliance on collateral as security for loans and to limit the emphasis that can be placed on the skill of the manager and the debt service capacity of the farm. Furthermore, it tends to an excessive concentration of farm debt in the very-short-term area.

into its highest return uses in the area. But the mere fact that such specialists are retained tends to get the lender involved in the management decisions of borrowers, especially those borrowers who for one reason or another have some difficulty meeting their debt service commitments. As commercial lenders take on lower quality loans (as judged by conventional standards), whether by intent or accident, the link between credit and management probably will become closer. Whether the results are good or bad will depend largely on the quality of the management that is extended along with the credit.

The financing of beginning farmers is mentioned as a special problem. It is receiving widespread attention. Nevertheless, evidence that too few prospective farmers succeed in becoming established in the business is most notable by its absence at this time. The rate of decline in the number of farms and the number of farmers probably needs to be accelerated, at least for a few years. Thus, the paper appropriately questions whether or not any additional general easing of credit availability to both young and established farmers would result in a bidding up of land values, further increases in production of surplus commodities, and be of questionable value. (The separation of government "assistance-type" loans from the cooperative system is a desirable move in that it will permit a more clear-cut evaluation of the role of "soft" credit in agriculture.) Nevertheless, the financing of beginning and undercapitalized farmers merits further study since this is an area in which the *quality* of credit service may be subject to substantial improvement.

A related question pertains to the relative roles of debt and equity capital in farm finance. As investment per farm increases further we may need to reexamine the commonly accepted goal of owner-operated farms free of debt. Is it plausible to expect individual farmers to provide all, or even most, of the capital needed in their business? If not, our research and teaching of farm finance possibly should be reoriented so as to place additional emphasis on explorations of all the various ways in which entrepreneurs can obtain the use of savings in addition to their own.

The growing interest in "corporate" ownership of farms (in which several individuals or firms have a partial ownership interest in the same farm) provides an illustration of one technique by which savings of several families can be channeled into a single farm business, in this instance on an equity rather than a debt basis. If this practice should become widely used, the credit requirements of agriculture would be of smaller proportions than if debt financing is used to make large globs of capital available to individual farmers. A more general use of the various types of rental, lease and labor share arrangements would tend to have the same effect. In the absence of a more widespread use of "fragmented ownership" and/or rental of various types, however, we probably should expect farm debt to expand substantially. In fact we probably should anticipate a demand for and, probably, the provision of "permanent"[3] real estate credit at least in the areas of high land values.

That agricultural finance has made considerable adjustment to changing credit needs, we can all agree. We probably can agree, too, that substantial further adjustments will be made in the future. The nature of the future adjustments, of course, is not clear but they may be more basic and more eminent than is implied in the paper to which these remarks are addressed.

[3] Loans on which the debt service consists of an annual interest charge but no required amount of principal payment each year.

DISCUSSION: MEASURING RISK IN FARM MORTGAGE LENDING

REYNOLD P. DAHL
University of Minnesota

The author of this paper is to be commended for undertaking a review of a problem in farm mortgage credit that merits considerable attention. The research methodology suggested is new and refreshing in that it evidences original thinking on a problem that has been largely assumed away in the past. Although researchers have undoubtedly recognized the value of obtaining cardinal measurements of risk components in farm mortgage lending, the complexities and interrelationships of the variables involved have discouraged efforts to obtain them. Few would doubt the usefulness of objective risk measurements in the pricing of farm mortgage credit in accordance with costs. As researchers, consequently, we must avoid assuming away the problem before considerable effort has been made to quantify risk components.

Most of my comments will be devoted to the difficulties of obtaining objective measures of risk and their probable applicability in making long-term farm mortgage loans.

Mr. Brinegar states positively, without presenting supporting evidence, that nonprice rationing in farm mortgage lending decreases returns to lenders and borrowers and lowers national income. This implies that price rationing in this instance is both desirable and practicable. Price in this instance is interest. Are we to conclude that it is feasible to have interest rates of sufficient flexibility to perform this task? Some commercial banks vary rates to different borrowers but they display no inclination to advertise the fact that they do so. If rates on mortgage loans by land banks and insurance companies are to be variable who shall be entrusted with making decisions in each case? In short, why make claims for the gains from price rationing if conditions make its use impracticable?

One aspect of the problem that the author does not deal with is the time element. Farm mortgage loans are typically made on an amortized basis with terms of up to 30 years. There are certain risk components that may be measurable largely on the basis of past experience at the time the loan decision is made. The author indicates that sufficient risk information is available and can be obtained from existing sources to construct models. Quantitative measures of risk components so determined may have limited applicability to a farm mortgage loan made today to be repaid within the next 25 years. Nothing is more certain than a changing agriculture and changes in demand. To what extent have changes in technology reduced production hazards in agriculture? Are risks associated with production hazards in the past indicative of the future? In addition, how are we to know whether or not production hazards such as drought will coincide with a period of depressed farm prices as occurred in the 1930's? Another point here is that shifts occur in the relative importance of types of farming with time. Several years ago dairying was regarded by lenders as being the most stable type of farming in Minnesota. Changes in demand in recent years have favored the corn-livestock farmer while dairying has suffered. Changes such as these can upset actuarial computations. It would seem to me the time factor in a farm mortgage loan is an important factor that would detract from the validity of risk measurements based largely on past experience. It is interesting to note in this connection that one of the conclusions of a study

of crop-yield risks in Great Plains farming was that both premiums and coverages of crop insurance in North Dakota need to be examined in the framework of expected future yield trends and farm costs rather than backward-looking actuarial computations.[1]

Another facet of the problem that will prove difficult is the weight to be assigned the management or personal factor. Quality of management is a much more important factor affecting success or failure in farming today than formerly. The larger farm business of today enlarges the opportunity for profits for the capable operator and for the poor operator makes failure more certain than in the days when success depended largely on frugality and hard work. Consequently, farm mortgage lenders today must give increased attention to management as a risk component.

Mr. Brinegar recognizes the problem of interdependence of variables in determining risk measurements. The management factor plays a very important role here. In fact, objective measures of factors affecting the funds that will be available to service the mortgage may be so modified by management as to render them of limited value.

The analogy drawn between the pricing of farm mortgage loans in accordance with the risk involved and differences in prices charged for life insurance is interesting. There are some parallel features; however, the basic differences are marked. Life insurance covers such a large sample of the entire population that mortality tables apply. Furthermore, items such as age, sex, and occupation are factors easily indentified. Major physical handicaps are readily detected and medical examination weeds out most of the clearly unfit.

The problem of measuring capacity to meet obligations is much more complex than that of determining life expectancy. Moreover, in life insurance some die before you expect them to but others live longer than expected. In loans, bad loans may result in losses, but good loans do not pay more than the principal.

Another aspect of the mortgage risk problem is that risk is associated with land productivity. One rather general conclusion from past studies of farm mortgage debt distress is the tendency of lenders to over-value farms of low productivity for loan purposes. In recent years we have undoubtedly made progress in evaluating differences in land productivity. Perhaps further research efforts could profitably be devoted to further refining this technique. A yield variation of five bushels per acre on corn makes a substantial difference in debt paying ability.

We agree with Mr. Brinegar that better measures of risk are needed in farm mortgage lending. Further research and study are in order. The purpose here has not been to discourage such undertakings but rather to point up some of the problems that we must be prepared to face and solve.

[1] Philip J. Thair, *Meeting the Impact of Crop-Yield Risks in Great Plains Farming*, North Dakota Agricultural College Experiment Station, Bulletin 392, June, 1954.

DISCUSSION: INFLUENCE OF TRADE CREDIT ON BROILER PRODUCTION

J. H. BLACKSTONE
Alabama Polytechnic Institute, Auburn

That trade financing and associated services have been the key to increased broiler production, at lower costs to consumers, is well shown by Mr. Gerald in his paper. Mr. Gerald used his experience and first hand knowledge of the poultry industry well in developing his paper on the "Influence of Trade Financing on Broiler Production." Although not in complete agreement with all statements in this paper, one must admit that, as a whole, it is a paper that will cause little disagreement. Mr. Gerald has covered a somewhat difficult and exceeding long topic in a minimum of space. His conclusions are both sound and thought provoking.

Neither the time allowed nor the topic assigned Mr. Gerald would permit him to cover all the points that one might wish to cover regarding the financing of broiler production. It is my belief that we can best spend the next few minutes by exploring some of the points not covered by Mr. Gerald rather than debating the merits or demerits of specific statements in his paper.

Mr. Gerald pointed out that trade credit was used by some 94 per cent of the broiler growers in four southern states in 1952. There have been estimates that feed dealers financed 90 per cent of the broilers produced in the U.S. in 1954. Certainly, there is no doubt that broiler production is closely tied to trade credit. Often the statement is seen that more growers should finance their own broiler production. Mr. Gerald did not make this statement. He points out that he does not know how each item of production has shared in the returns. It can be added that we have no positive data, at least in the South, as to how growers who finance themselves have faired over a long period. The point to be made is that more care should be taken in advising growers to go on their own until more and better data are at hand with which to advise. Under certain cost-price relationships, cash production pays; under others, losses can be extremely heavy. But how a cash grower would fare over the long-run is unknown.

The Southern Regional Poultry Marketing Committee currently has a study underway that is attempting to compare cash growers with growers using various other types of financing arrangements. So far, this study has no concluding data to report. In fact, the number of cash producers in the South is so small that it may never be possible to make a reliable comparison of the cash and non-cash groups. It may be possible that states outside the South could best make this comparison. For instance, a study in Illinois made by Ralph A. Benton[1] showed that of the growers included, some 44 per cent financed themselves for operating capital, feed dealers financed 49 per cent, and 7 per cent borrowed from commercial banks. This study was made in late 1953 and early 1954. Although costs and returns were shown for a number of production factors, no report was made of a comparison of growers who financed themselves with those who were dealer financed. Since the two groups were about equal in number, this would have been possible.

[1] Ralph A. Benton, *The Illinois Broiler Industry*, Illinois Farm Economics, No. 223, p. 1586, June 1955.

Garlock, *et al.*,[2] in their study of banks and production credit associations in the South, reports on loans made to growers over a 5-year period. While they found some loans made by institutions to growers, they found that banks were financing the broiler industry mainly through loans to dealers and others, rather than directly through loans to growers. As a whole, it was found that banks were reluctant to lend money for chicks, feed, and other supplies, with only the chickens and supplies as security. As a whole, growers who were financed by banks had much larger broiler operations than did growers who were financed by feed dealers. Banks were more varied in their requirements for security on loans than were feed dealers. These requirements run all the way from no security to very rigid requirements of securing mortgages on real estate or combinations of real estate and personal property. Differences in security requirements on loans made to finance broiler growers apparently resulted largely from differences in the policies of lending institutions rather than from differences in the degree of risks attached to loans. Certainly, broilers were not highly regarded by banks as security for loans. When chicks were taken as security, the main purpose apparently was to put other creditors on notice that the lending agency had a lien on the chicks. Insofar as the risk was great enough to require security, the lenders studied preferred livestock, machinery, or real estate to broilers as security. Lending institutions usually financed broiler growing as a part of a diversified farming operation and looked to the entire farm operation rather than to any given lot of broilers as the source of liquidation for loans. Through renewals and extensions, banks give a flexibility to their credit that is not reflected by the period for which loans are originally dated.

Interestingly enough, no losses were sustained by banks or production credit associations on loans to any growers covered by the study. The policy used to select risks was perhaps a big factor in this success. Most loans were confined to growers who had substantial assets and who appeared to have considerable income apart from their broiler operations. The methods used and security often required helped lending institutions to avoid losses even though borrowers may not have been successful with their broiler operations. There is no data available on how these growers came out on their broiler operations.

Commercial lending institutions can finance broiler production only by making loans to borrowers who can be financed at small risk. Their loans must be confined to those who are not only able to absorb, but are willing to assume, the losses that often result from broiler operations. However, these agencies would probably finance many more growers than they do if more growers desired to produce broilers exclusively on their own account.

We cannot expect a major change in the methods of broiler financing within the next few years. Production of broilers will continue to be a joint venture of growers and suppliers. Commercial lending agencies will remain hesitant, and rightly so, to enter very far in this field. Most likely the number of growers who would like this type of financing will remain small. As pointed out previously in this paper, data to support the conclusion that more growers should finance themselves or use conventional credit are conspicuous by their absence. Many have pointed to a need for changes in other types of agricultural financing. It may be that the broiler industry is a leader in the field of financing and in the

[2] F. L. Garlock, R. J. Becker, *et al.*, *Financing Broiler Production by Banks and Production Credit Associations in the South*, Southern Cooperative Series Bulletin No. 44, June 1955.

supplying of associated services as it has been in the field of technological developments in production and marketing. Certainly, there is a need for research here and less of the implied "Something is wrong attitude."

So far, we have had a number of basic financing plans and many variations of these plans have been used. Adaptations may have been used that at times gave advantages to growers and at other times to dealers. Unfortunately, as Mr. Gerald points out, little is known about how each item of production has shared in returns. Neither dealers nor growers are satisfied for a long period with the types of contracts used. In many respects, this is to be expected. It has been a part of the evolution mentioned by Mr. Gerald. It is a part of the growth that carried production from 34 million to 1 billion broilers in a short span of 20 years. This evolution has carried the broiler industry up a mountain side to a plateau. The industry may take a short rest on this flat surface. However, it can be expected to move forward from there to much greater heights.

Technological advances have done much to decrease mortality, balance rations, improve production practices, breed better birds, and in other ways speed up production and lower costs. Many of the production risks have been lowered. Others will be lowered with time. Comparable and closely related results in processing have occurred. Yet, the bottleneck of today may be in the marketing end. The future can expect advances in this field. Many of the marketing risks and wide price fluctuations may be closely related to the inability to store broilers for long periods or to present them to housewives in a wide variety of forms. The future will see many changes in this. We can expect to see improvements in shelf life of broilers, new and better methods of refrigeration and freezing, or perhaps no refrigeration through the use of radiation. New developments will occur in packaging, availability of broilers to small markets, and more convenience to the housewife through pre-cooked and partial-cooked broilers and/or parts. These innovations will lead to a longer marketing period and a more stable supply on all markets. Better information will be developed on consumer demand. With the accomplishment of these potentials, it will be possible to develop financing arrangements that are known to be equitable to all parties. Today it is not possible to answer the question whether any particular grower contract is good or bad. However, we can be assured that improvements can and will be made. To do this, the marketing economist must help to tackle many of the problems of promotion, merchandising and financing simultaneously. Known equitable contracts for growers and dealers cannot be developed independently of other needed research. Needed research in this field presents us with an opportunity and a challenge.

DEMAND ANALYSIS

Chairman: L. L. Boger, Michigan State University

HOW MUCH PROGRESS HAS BEEN MADE IN THE STUDY OF THE DEMAND FOR FARM PRODUCTS?

E. J. Working
State College of Washington

AN EASY way to answer the question that has been assigned me would be to say, "great progress." But that would mean little or nothing without an explanation of what the progress consisted of. Indeed, I think that one might just as well say that very little progress has been made. Either statement could be amply defended. Either, by itself, would be equally meaningless.

At the outset I must recognize that an appraisal of the extent of progress in the study of the demand for farm products may depend upon what is meant by the term "demand." I refer to the use of the term in the "market" sense as compared with the "schedule" sense. Obviously, if we use the term "demand" to mean merely quantity demanded, any progress made in learning about quantities of farm products sold or consumed—that is in obtaining better quantity statistics—must be considered progress in the study of the demand for those products. Progress in improving our price statistics would be on a different footing, for such statistics would not measure demand directly but would provide better data for use in explaining why demand varies as it does.

In my discussion I shall consider that the study of demand consists of the study of the relationship between quantity demanded and price—including how and why that relationship varies as among points of time, geographical regions, income groups, racial groups and so on. Progress in the study of demand may come about through: (1) new data; (2) new methods of analysis of data; (3) new concepts of demand relationships; and (4) new applications of available data, methods, and concepts to the study of demand.

It is clear that much progress has been made in the development of new data pertinent to the study of demand. When Hooker, Lehfeldt and Moore were making their studies prior to World War I, data on quantities of farm products sold and consumed were much inferior to those now available from the standpoint of both coverage and accuracy. Similar, though perhaps less marked improvments were made in the basic price data.

To a large extent the improvements in statistical data were the result of the war. Agencies such as the War Food Administration and the War

Industries Board collected a large amount of material concerning production, consumption and prices. Such data were essential to their administrative operations. Even though some of the agencies themselves disappeared soon after the war, the work they had done provided the basis for an expanded program of data collection by established agencies such as the Department of Agriculture, the Labor Department and the Department of Commerce.

The wartime inflation and subsequent deflation directed attention to the study of prices. There was intense interest both in what had happened to prices and in why it had happened. The former resulted in an expansion in the collection of individual price series and also in the construction of new indexes of wholesale, retail and "farm" prices. Thus, those interested in the study of demand had new data and tools as well as new incentive for their work.

During the decade following World War I, those who were making statistical studies of demand could not reap full benefit from the improved basic data currently available to them. In making time series analyses they had either to combine the less adequate prewar data with the improved postwar series or else use only data that covered a woefully short period of time. Nevertheless, it was a decade of great progress in demand analysis. New methods were used in the analysis of data, new concepts were developed toward integrating demand theory with statistical procedures, and many new statistical studies of demand were carried through. There was general adoption of "deflation" and of multiple correlation and regression techniques in making studies of demand. Among the pioneers were Holbrook Working, Henry Schultz, George Haas, Mordecai Ezekiel, B. B. Smith, and Louis Bean.

By the close of the 1920's, nevertheless, it was evident that all was not well with demand analysis. Too many price forecasts based on the analysis had "gone wrong." Basic doubts had been raised about the applicability of correlation methods to time series data. The whole logic of the assumption, that regressions between price and quantity of a commodity could be assumed to approximate demand curves of theory, had been questioned. These doubts stood without satisfactory answers.

To a considerable extent the doubts that existed at the close of the 1920's were satisfied by the progress made in the following decade. Of outstanding importance was the development of indexes to account for shifts in the general level of demand for farm products. Previously, shifts in demand had been dealt with primarily through (1) the removal of trends in the original price and quantity series, (2) the use of percentage changes and link relatives, (3) application of trends to residuals, and (4) use of time or a price index as an independent variable in multiple

correlation. "Deflation" of prices may be looked upon as a means of adjusting for changes of demand, but it is more commonly considered to be a way of adjusting for changes in the value of money. Some of the correlation analyses of the 1920's had, it is true, used rudimentary indexes such as pig iron production and the Harvard price index of business cycles in the attempt to take account of shifts in the general level of demand. However the efforts were without much success until we had gone through the experience of the depression of the 1930's and had used improved indexes of demand such as factory payrolls, industrial production, "consumers income," non-agricultural income, and disposable income.

In the 1930's, as during the previous decade, statistical studies of demand increased apace, but relatively few were published. In the United States such studies of demand had established themselves as useful, perhaps even as essential, to the preparation of "outlook" statements and as a basis for many of the policy decisions of the "action agencies" of the federal government. Many of the demand studies were carried on purely as an adjunct to such decision making, with no thought of publication. In other cases, perhaps because the work was carried on under pressure or because of unresolved doubts as to the meaning and reliability of the results, the studies were never considered finished and suitable for publication by those who conducted them. On the other hand, Henry Schultz published his monumental *Theory and Measurement of Demand.*

Among the accomplishments of the decade was the gathering of a vast amount of data in the United States concerning consumer purchases and incomes. There were also important advances in the quality and coverage of time series data pertinent to the analysis of demand. From the standpoint of methodology and application of new concepts Frisch's "confluence analysis" and the work of Tinbergen were among the notable accomplishments.

Although some of the doubts and uncertainties about demand analysis were resolved by the progress of the 1930's, some unsettled questions of procedure and interpretation remained. Attention had been redirected toward "least squares bias" and to the question of whether or not the single demand equation model used in least squares regression analysis was really a satisfactory approach to the measurement of demand. An outstanding new method—system of equations analysis—was proposed by Haavelmo in 1943. This led to new interest and enthusiasm in demand analysis, including an enthusiasm on the part of some to cast aside single equation methods as wholly inappropriate and incapable of yielding reliable indications of the elasticity of demand.

Inasmuch as the next paper is on "A Comparison of Single and Simul-

taneous Techniques," I shall not trespass on Dr. Foote's field with a detailed description or analysis of the systems of equations method. A general appraisal, however, should not be out of place. In my opinion the development of the system of equations concepts and techniques has constituted a major advance. Although the method was designed to deal with "disturbances" rather than with observational error, it is quite effective in avoiding bias due to random observational error. It completely avoids bias from uncorrelated error in the endogenous variables. Even though bias results in the reduced form equation coefficients from any uncorrelated error in the exogenous variables, the biases tend to compensate for each other in the computation of the coefficients of the structural equations.

However, the use of the system of equations approach is by no means a fool-proof method that assures reliable estimations of demand and supply functions. Indeed, I doubt that the results of the method have in most instances provided any more reliable estimates of demand elasticities than have single equation methods. It is probably always true that a system of equations is necessary to represent the basic economic structure. It does not follow, however, that it is necessary or even desirable to use the system of equations method in estimating a demand equation for a commodity.

The great contribution of Haavelmo and his followers lies partly in the fact that they have forced demand analysists to recognize the dangers and biases of least-squares approximation of demand equations by single-equation methods. The greatest dangers of misinterpretation of equation analyses lie, however, in the influence of these observational errors and omitted variables that are correlated with the included variables. The system of equations methods present especially difficult problems of appraising the effects of such errors and omissions on the estimates of the structural equations.

In the decade since the close of World War II students of demand have been faced with difficult tasks in trying on the one hand to make satisfactory use of the concepts and methods developed by Haavelmo, Tintner, and their followers, and on the other hand in trying to reconcile the data relating to demand in the periods before and after the war. Probably few of those who are true "data analysts" feel at all well satisfied with their results. Nevertheless much noteworthy work has been done, including in this country the demand and price structure studies of the AMS and numerous studies at our state agricultural experiment stations. The work done abroad includes that of Wold and Jureen, and of Stone and Rowe. In mentioning the work of some individuals, I have done so by way of illustration rather than of appraisal. The omission of

many others, consequently, should not be taken to indicate any lack of importance of their work.

Most quantitative studies of demand have made use of time-series data. This, however, should not cause us to loose sight of the fact that cross-sectional data have been used to study the effects, on consumption and sales, of income differences, geographical location, and other differences including price differences. Some studies, indeed, have made use of both temporal and cross-sectional differences in studying price and quantity relationships.

Perhaps the most unsatisfactory part of our knowledge of demand is in the area of demand dynamics. We have long recognized that there may be differences between short-run and long-run elasticities of demand, but little progress has been made in measuring them. This may result in part from the need to simplify the complex details of reality in order that our minds can grasp the important underlying facts and relationships. In so doing we may be prone to think in terms of *the* elasticity of demand for wheat, potatoes, or any other agricultural product. In any event many books and articles may be cited where the authors seem to assume that there is some single elasticity of demand for each commodity, and that whatever coefficient of elasticity they or someone else has estimated can be applied in reasoning about the effects of a tariff, acreage restriction, price control, change in size of crop or other influence.

There is surely clear logic to the view that a lowered price will ordinarily have more influence on the rate of consumption of a commodity if the lower price is continued over a long period of time than if it is quite temporary. The principle is no different than when we expect a long-continued advertizing campaign to have more effect than one of short duration. Conversely, a reduction in supplies of potatoes may be expected to cause people to bid prices much higher at first in the attempt to maintain their accustomed consumption habits. However, a reduction continued over a period of years would give consumers time to become accustomed to substitute foods and they presumably would not bid prices so high as at first.

Nevertheless, elasticities derived by the usual methods from annual data that show wide year-to-year fluctuations of prices and quantities have been widely used as though they were long-run or "normal" elasticities. One can even find cases where elasticities derived from weekly data were so used. Perhaps for most farm products there is little difference between long-run elasticities and those derived by the usual methods of analysis of annual data, but we need to analyze our data with other possibilities in mind.

Attempts to deal statistically with the dynamics of demand are, of

course, nothing new. Lagged variables have been used in many studies, but for the most part, analyses have not been designed or interpreted in the light of their possible meaning as to differences between short-run and long-run elasticities. In some cases the attempt has been to determine what lag yielded the highest correlation. In other cases, if quantity was the dependent variable, both the current and the previous year's price or income might be used as independent variables and the interpretation would be in terms of the different effect of the two variables.

The methods used and a lack of full understanding as to their implications may well have caused some analysts to discard as untenable, results that were actually consistent and valuable. Let us suppose, for example, that someone used an equation of the form:

$$\text{Log } P_t = a + b_1 \log Q_t + b_2 \log Q_{t-1} + \ldots$$

If he obtained a positive instead of a negative value for b_2 he might discard the results as not being a possible causal relationship. Actually, however, such results should suggest that the long-run elasticity is greater than the short-run. They are fully consistent with negatively sloping short-run and long-run demand curves. Thus, if the coefficients were as follows:

$$\text{Log } P_t = a - 2 \log Q_t + 1 \log Q_{t-1} + \ldots$$

we would have the precise equivalent of:

$$\text{Log } P_t = a - 2(\log Q_t - \log Q_{t-1}) - 1 \log Q_{t-1} - \ldots$$

or of:

$$\text{Log } P_t = a - 2 \log (\%Q_t \text{ is of } Q_{t-1}) - 1 \log Q_{t-1} - \ldots$$

In the latter two equations the evidence of differing long-run and short-run elasticities would be clearer if quantities for the previous time period were an average of several previous years instead of a single year.

Probably the principal reason for our lack of quantitative knowledge of the dynamics of demand lies in the inherent difficulty, if not impossibility, of obtaining reliable estimates of long-run elasticities of demand. The available data must, in the first place, exhibit long-run changes in prices and quantities. Furthermore, unless there are a number of such fluctuations, any evidence as to the degree of long-run elasticity is likely to be very unreliable.

In conclusion, I should like to point out that in any attempt to appraise the satisfactoriness of our knowledge of the demand for farm products we must recognize that different people still obtain rather widely different and unreconcilable estimates of the elasticity of their demand. There is nothing wrong about obtaining different elasticities because each commodity must be considered as having a whole system of elasticities. What is the proper elasticity will depend upon whether or not the demand is for consumption, or for storage, or for consumption and storage; and also it

will depend upon the market area to which the elasticity refers. It will depend upon whether the elasticity is measured in terms of "farm," or wholesale or retail prices, as well as upon the geographical location of the price series. It will depend upon the time span of the observation period and the length of time between the cause and response in the price-quantity relationship. But the different estimates for any single commodity should be reconcilable with each other, else we must admit that our knowledge of the demand for farm products and of the methods of measuring it are far from satisfactory.

A COMPARISON OF SINGLE AND SIMULTANEOUS EQUATION TECHNIQUES

RICHARD J. FOOTE*
Agricultural Marketing Service

IN MY opinion, much needless confusion exists in the minds of economists and statisticians when they think about least squares versus simultaneous equation techniques. Some analysts believe that the method of least squares now is completely outmoded; others feel that simultaneous equation methods are so complex and computationally expensive that they should be avoided whenever possible. Each of these viewpoints is wrong. Simultaneous equation techniques are a useful addition to our kit of tools for use in problems that deal with the obtaining of structural coefficients. When they are needed, they should be used, just as a hack saw is used to cut metal, whereas various woodsaws can be used to cut wood. In systems of equations, one, several, or perhaps all frequently can be fitted by least squares. Moreover, least squares equations are useful now, just as they always have been, in showing normal or average *relationships* that exist between sets of variables. Many problems that relate to analyses of this kind, such as choice of variables, location of data, choice of functional forms, and the testing and interpretation of results, are almost identical regardless of whether the equations are to be fitted by least squares or by simultaneous equation techniques.

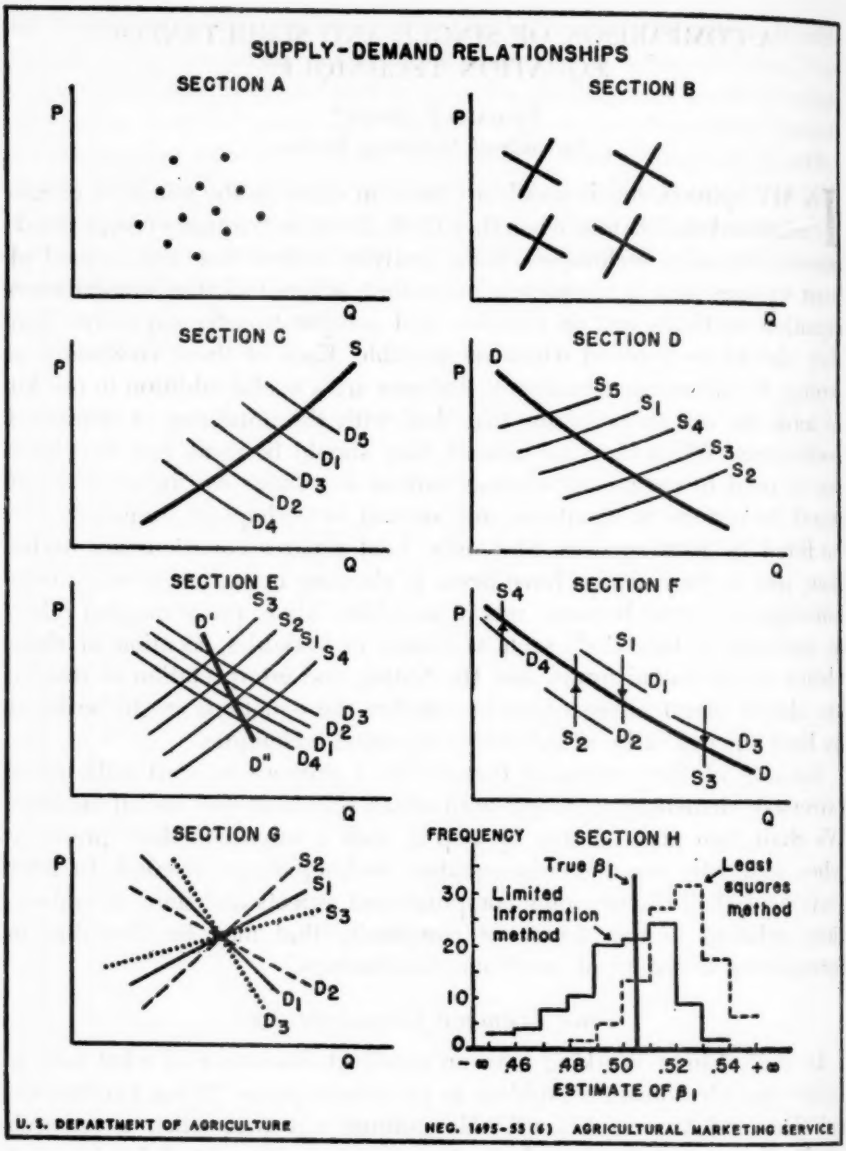
Because of the confusion that exists, I propose to start with some extremely elementary concepts with which I am sure you are all familiar. We shall then proceed step by step in such a way as to show precisely when and why simultaneous equation techniques are needed. In later sections, I shall discuss some computational aspects and some considerations relating to the degree of complexity that may be desirable in formulating a system of economic relationships.

Some Economic Considerations

In 1927, Elmer Working gave an excellent discussion of what now is called the *identification* problem in his classic paper "What Do Statistical 'Demand Curves' Show?"[1] He pointed out that when a research worker begins a demand study, he is confronted with a set of dots like that shown in section A of the chart on supply-demand relationships. He

* The author wishes to thank Glenn Burrows of the Agricultural Marketing Service for a number of helpful suggestions on the statistical aspects of this paper.

[1] *Quart. Jour. Econ.*, 41:212-235, February 1927. A similar line of reasoning is followed by Tjalling C. Koopmans in his "Identification Problems in Economic Model Construction," pp. 27-35. This is given as Chap. II of *Studies in Econometric Method*, Cowles Commission for Research in Economics Monogr. 14, 1953.



knows that each can be thought of as the intersection of a demand and a supply curve, as in section B, but, without further information, neither curve can be determined from the data. Working then noted that if the demand curve has shifted over time but the supply curve has remained relatively stable, as in section C, the dots trace out a supply curve; conversely, if the supply curve has shifted but the demand curve has remained

stable, as in section D, the dots trace out a demand curve. If correlated shifts for each curve have taken place, as in section E, the dots trace out what may look like a structural demand or supply curve, but the slope will be too flat or too steep.

In many analyses of the demand for agricultural products, factors that cause the demand curve to shift over time are included as separate variables in a multiple regression equation. In effect, we are then able to derive from our estimating equation an average demand curve. This is indicated in a rough way in section F. In some analyses, we can assume that the quantity supplied is essentially unaffected by current price. When price is plotted on the vertical scale, the supply curve in such cases is a vertical line, and year-to-year shifts in the supply curve trace out a demand curve, just as they did in section D. Under these circumstances, we may be able to obtain valid estimates of the elasticity of demand by use of a least squares multiple regression analysis for which price is the dependent variable and supply and some demand shifters are used as independent variables. This point was noted by Working in his 1927 paper,[2] emphasized by Ezekiel in a paper published in 1928,[3] and reconsidered in 1953 by Fox[4] in the light of modern simultaneous equations theory. For many agricultural products, this set of circumstances permits us to estimate elasticities of demand with respect to price by use of single equation methods. Two points however, should be kept in mind: (1) Price must be used as the dependent variable in order to obtain elasticity estimates that are statistically consistent, since, to use the least squares technique, the supply curve must be a vertical line; and (2) an algebraic transformation must be made after the equation has been fitted to derive the appropriate coefficient of elasticity, since the definition is in terms of the percentage change in quantity associated with a given percentage change in price. Other circumstances under which least squares equations can be used to derive coefficients of elasticity are discussed in a later section.

What happens if we have a supply curve that is not a vertical line? If we consider any single point, as in section G, we have no way of knowing on which demand and supply curve of a whole family of curves it lies. The basic problem of indeterminateness is similar to that in which correlated shifts in the demand and supply curves take place. What is needed is some hypothesis, adequately tested and proven to be sound, as to the nature of the joint relationships between supply and demand.

---

[2] *Op. Cit.*, p. 223.

[3] Mordecai Ezekiel, "Statistical Analyses and the 'Laws' of Price," *Quart. Jour. Econ.*, 42:199-225, February 1928.

[4] Karl A. Fox, "The Analysis of Demand for Farm Products," U. S. Dept. Agr. Tech. Bul. 1081, September 1953.

We should then be able to untangle the two and to obtain a reliable estimate of the slope of each curve. This is essentially what is involved in the simultaneous equations approach. This concept was set forth by Haavelmo in 1943.[5] Staff members of the Cowles Commission spent a considerable part of the next 10 years in showing how to implement it when working with actual data.

Suppose, however, that the analyst has no interest in the true demand and supply curves but only wants a method that will assist him in studying probable future trends in prices. Working had some suggestions on this point, too. He said, "It does not follow from the foregoing analysis that, when conditions are such that shifts of the supply and demand curves are correlated, an attempt to construct a demand curve will give a result that will be useless. Even though shifts of the supply and demand curves are correlated, a curve which is fitted to the points of intersection will be useful for purposes of price forecasting, provided no new factors are introduced which did not affect the price during the period of study. Thus, so long as the shifts of the supply and demand curves remain correlated in the same way, and so long as they shift through approximately the same range, the curve of regression of price upon quantity can be used as a means of estimating price from quantity."[6]

The problem here is that the shifts almost never "remain correlated in the same way" over a sufficiently long period to generate enough data to fit our equation. In some circumstances, changes in structure are so frequent that multiple regression equations almost always yield low correlations and frequently even "wrong" signs on the coefficients. This is particularly apparent when we attempt, by the single equation approach, to study factors that affect volume of exports. In other cases, changes in structure are of minor importance and least squares equations may yield completely satisfactory results in terms of showing relationships that have prevailed between simultaneously-determined economic variables over a considerable period of time. This is frequently true when we study relationships between prices at specified locations or at local market, wholesale, or retail levels. Even here, however, the analyst should examine his results closely, perhaps by plotting the data in scatter diagrams, to determine whether changes in structure have affected the relationship. The in-between case is the one that can be dangerous. Here the coefficients may suggest that the analysis is satisfactory; it may, in fact, be of little value for the study of future trends.

[5] Trygve Haavelmo, "The Statistical Implications of a System of Simultaneous Equations," *Econometrica*, 11:1-12, January 1943. A more complete discussion by the same author is given in "The Probability Approach to Econometrics," *Econometrica*, v. 12, Supplement, 1944.

[6] *Op. cit.*, p. 227.

Marschak[7] gives an interesting example of the importance of changes in structure on the need for using a complete system of equations. He considers the old problem of taxation of a monopoly. He points out, "Knowledge is useful if it helps to make the best decisions." He considers, among other things, the kinds of knowledge that are useful to guide the firm in its choice of the most profitable output level. If the tax rate has not changed in the past and is not expected to change, the firm can fit an empirical curve to observed data on output and profits and immediately derive the point of maximum revenue. If the tax rate has not changed in the past but is expected to change in the future, the firm could, if it so desired, vary its output and profits under the new tax structure and derive a new empirical relation. But this takes time, and substantial losses might occur during the experimental period. If the firm had taken the trouble to derive the structural demand and net revenue curves, it could determine immediately its most profitable output under the new tax structure. If the tax rate had varied during the initial period, an empirical regression of net revenue on output and the tax rate could have been fitted and used to find the most profitable output under the new tax structure. In many real life situations, changes in structure are frequent. Hence Marschak concludes: "A theory may appear unnecessary for policy decisions (or forecasting) until a certain structural change is expected or intended. It becomes necessary then. Since it is difficult to specify in advance what structural changes may be visualized later, it is almost certain that a broad analysis of economic structure, later to be filled out in detail according to needs, is not a wasted effort."

This argument in no way invalidates the use of a single equation to estimate elasticities of demand in those cases in which the supply can be considered as unaffected by current price. In such cases, we may obtain estimates of the structural parameters that can be used in the same way as any other statistically-valid estimates. Instead, Marschak is arguing that only rarely should the economic analyst be satisfied with a purely empirical fit if he can obtain structural relationships with some additional work.

Some Statistical Considerations

We now turn to some statistical considerations that have a bearing on the extent to which we can use least squares to estimate the coefficients in a given equation. In the relationships discussed in the preceding section, we have assumed, more or less implicitly, that the points lie

[7] Jacob Marschak, "Economic Measurements for Policy and Prediction," Chap. I in *Studies in Econometric Method*, Cowles Commission for Research in Economics Monogr. 14, 1953.

exactly on the demand or supply curve. In actual statistical analyses, this is never true, since some variables that cause the curves to shift always are omitted and the precise shape of the curves to be fitted are not known. Thus we assume that we are dealing with *stochastic* rather than *functional* relations. A stochastic relation basically is one that includes a set of unexplained residuals or error terms whose direction and magnitude are usually not known exactly for any particular set of calculations, but whose behavior on the average over repeated samples can be described or assumed.

In order to have a concrete example about which to talk, let us consider the following equation:

$$Y = a + b_1Z_1 + b_2Z_2 + u \qquad (1)$$

Here Y is the variable for which an estimate is desired, the Z's are 2 variables which are known to affect Y, and u is an error term. We assume that for a number of periods we know the value of Y and the Z's and we wish to estimate a, b_1, and b_2. We do not know the value of u but can estimate it in a rough way for any given period as the difference between the value of Y computed from the equation and its actual value.

We know that estimates of the regression coefficients will differ for different sets of observations. However, we would like to estimate them in such a way that the *average* value for a large number of periods or samples equals the value that would be obtained from a similar calculation based on the combined evidence of all possible samples. Estimates of this sort are known statistically as *unbiased* estimates. We also would like the variation of the estimates about their average or true value to be as small as possible, since under this circumstance we would have more confidence in any single estimate than if we had a large amount of variation. Estimating procedures that give the smallest possible variance are known as *best* estimates. Despite their name, such estimates possess no more desirable properties than many alternative estimates. So the choice of terminology is unfortunate, but it has become firmly established. In certain circumstances, we may be unable to obtain best unbiased estimates but may be able to obtain estimates that are *consistent* and *efficient*. A consistent estimate is one that is unbiased when we work with all the possible data; it may or may not be biased in small samples. In actual practice, of course, we never have all possible data, but estimation procedures that give consistent estimates presumably are better even with small samples than are those that are known to be biased even with an infinitely large sample. Efficient estimates are similar to "best" estimates, except that they are known to give the smallest possible variance only when we work with all possible data.

If we use the method of least squares to estimate the coefficients in

equation (1), we obtain best unbiased estimates if the u's and Z's meet certain rather rigid specifications. Some of the specifications that relate to the u's are difficult to state precisely in nonmathematical terms, but essentially they require that the u's follow *some* (not necessarily a normal) probability distribution, that their average or expected value be zero, that their variance be finite and independent of the Z's (the latter is the property of homoscedasticity, for those of you who remember your elementary statistics), and, finally, they must be serially independent. When working with economic data, we usually assume that these assumptions hold; but we may test at least the one regarding serial independence of the residuals after we have run the analysis. In some cases, we transform the data to (1) logarithms, which frequently helps to render the variance of u less dependent upon the Z's, or (2) first differences, which when working with economic data frequently tends to reduce the serial correlation in the u's. As an alternative we may, of course, use first differences of logarithms.

In addition there is a specification regarding the Z's that is easily stated but frequently disregarded by economists. To be certain that the least squares approach will give best unbiased estimates, each Z must be *a set of known numbers,* in contrast to a random variable. When attempting to obtain elasticities of demand, this is true only in rare instances. The only case of which I can think is the one for which prices are arbitrarily set at certain levels, as in a retail store experiment, and the quantity bought by consumers at these prices are recorded. I know of only one experiment that has been conducted in this way—that for oranges by Godwin.[8] The least squares method was developed for use in connection with experiments in the physical sciences, where the independent variables frequently are sets of known numbers, or to study relationships between variables, such as heights of fathers and heights of sons, where no "structural" coefficients are involved.

Econometricians have shown that the least squares approach will give estimates of the structural coefficients that are statistically consistent and efficient, provided the u's meet approximately the same requirements as for the previous case, if the Z's are predetermined variables. A simplified proof of this is given by Klein,[9] although a fairly advanced knowledge of calculus and of the principles of probability given in chapter 2 of his book are required to follow his development. Just as the term "best" as used by statisticians is an unfortunate one, the term "predetermined" as

[8] Marshall R. Godwin, "Customer Response to Varying Prices for Florida Oranges," Fla. Agr. Expt. Sta. Bul. 508, 1952.

[9] Lawrence R. Klein, *A Textbook of Econometrics,* Row, Peterson and Co., 1953, pp. 80-85.

used by econometricians is unfortunate. But as it now is commonly used in the literature, it seems advisable to learn what it means so that we can continue to use it. *Predetermined* variables include those that the analyst takes as given, while *endogenous* variables are those that are determined simultaneously by the same set of economic forces and, therefore, are to be estimated from the model. The predetermined variables commonly are divided into *exogenous* variables and lagged values of endogenous variables. Lagged values of the endogenous variables, naturally, are values of these variables for a previous time period. Exogenous variables include all other variables that might enter into an analysis. Weather is a commonly cited exogenous variable. For many variables, the exact economic structure of the segment of the economy being studied must be carefully considered to determine whether they should be classified as endogenous or exogenous, and frequently different analysts will classify them in different ways.

We now can reconsider an example cited earlier. In section F we showed a diagrammatic representation of a situation for which the least squares method could be used to estimate the slope of the demand curve. We now know that this estimate will be statistically consistent and efficient only if the quantity consumed and the demand shifters each can be classified as an exogenous or lagged endogenous variable. Fox[10] has argued that this is approximately true for a considerable number of agricultural products, including meat, poultry and eggs, feed grains, and a number of fresh fruits and vegetables. Under the assumptions of Fox, market price is used as the dependent variable and the independent variables are supply (which is assumed to be highly correlated with consumption) and some relevant demand shifters, including usually disposable income. Another situation under which we can use the method of least squares to estimate elasticities of demand is that for which data are available on purchases or consumption of individual consumers, as prices that confront consumers are determined chiefly by factors other than those that affect their purchases. In this case, consumption is taken as the dependent variable and retail prices of the various items, family income, and perhaps other household characteristics, are taken as independent variables.

One further problem needs to be considered before leaving the statistical aspects of this subject. In all cases given previously, we have assumed implicitly that the variables are known without error. Any analyst who has been connected with the compilation of data from original sources knows that errors of one sort or another always creep in. These can result

[10] *Op. cit.*

from memory bias on the part of respondents, inability to find all of the people in a complete census, errors of sampling, and a host of other reasons beyond the control of the most careful investigator. Whenever we work with economic series, nonnegligible errors in the data are known to exist.

Fox has suggested an easy way to correct for this, provided we are willing to make an informed guess about the average magnitude of the errors.[11] Such guesses or estimates can be made by carefully reading how the series was compiled or, preferably, by talking to the person in charge of the compilation. For most series, we have a fairly good idea as to whether the error is in terms of, say, a few percent, 10 to 20 percent, or something higher. If we wish, we can experiment with various assumptions about the level of error, compare the effect on our coefficients, and then arrive at a rather good idea as to the effect which likely errors may have on their magnitude.

Because of the importance of a correction of this sort, I would like to show you exactly what is involved in an extremely simple case. All of you know, I am sure, that when we express variables in terms of deviations from their respective means, the least squares regression coefficient between two variables is given by:

$$b_{yx} = \frac{\Sigma yx}{\Sigma x^2}$$

Suppose that y and x are each subject to error and that the magnitude of the error is given by d and e, respectively. The sample regression coefficient then equals:

$$b^*_{yx} = \frac{\Sigma\ (y + d)(x + e)}{\Sigma\ (x + e)^2}$$

Let us now expand the numerator and denominator. We obtain:

$$\Sigma(y + d)(x + e) = \Sigma yx + \Sigma ye + \Sigma dx + \Sigma de$$
$$\Sigma(x + e)^2 = \Sigma x^2 + 2\Sigma xe + \Sigma e^2$$

If d and e are random and independent and we have a large sample, any summation term that involves one or both of them as a cross-product equals approximately zero. Summation terms that involve their squares, however, do not equal zero. Applying this principle, when the variables

[11] This approach and some examples based on it are described in some detail by Richard J. Foote and Karl A. Fox in "Analytical Tools for Measuring Demand," U. S. Dept. Agr., Agricultural Handbook 64, 1954, pp. 29-35.

are subject to error, we can write the value of the regression coefficient in the following way:

$$b^{\circ}_{yx} \simeq \frac{\Sigma yx}{\Sigma x^2 + \Sigma e^2}$$

This gives a biased estimate of b_{yx} because the denominator is too large. But if we reduce the sum of squares for the independent variable by an amount proportional to the assumed percentage error, then we obtain an estimate of the regression coefficient that is approximately unbiased provided the only source of bias is that due to errors in the data. Such a correction can be made easily. In working with multiple regression coefficients, some formulas involve sums of squares for the dependent variable also, so all sums of squares that enter into the analysis should be corrected in a similar way. I see no reason why the same sort of correction could not be applied to the sums of squares that are involved in equations to be fitted by the simultaneous equations approach.

Some Econometric Considerations

Discussion in the preceding section suggests, and econometricians have shown that if we use the least squares approach to estimate the structural coefficients in an equation that contains current values of 2 or more endogenous variables, we obtain estimates that are statistically biased. The mathematical nature of the bias has been shown by a number of authors in a supposedly popular way,[12] but I have yet to find an explanation that is completely satisfactory for a nonmathematician. We do, however, have some experimental evidence of the kind of bias that results when the method of least squares is applied in such cases. Methods which have been developed to handle equations that contain 2 or more endogenous variables are known to give estimates that are statistically consistent, but methods are not now available that are known to be statistically unbiased. Thus, we cannot say for sure what happens when we work with the small samples that usually are involved in economic research. An experiment was designed to measure the kind of bias that arises when we apply these methods to small samples[13] and, as a byprod-

[12] See, for example, Jean Bronfenbrenner, "Sources and Size of Least-Squares Bias in a Two-Equation Model," Chap. IX in *Studies in Econometric Method*, Cowles Commission for Research in Economics Monogr. 14, 1953; E. G. Bennion, "The Cowles Commission's 'Simultaneous-Equation Approach': A Simplified Explanation," *Review Econ. and Statis.*, 34:49-56, February 1952; and John R. Meyer and Henry Lawrence Miller, Jr., "Some Comments on the 'Simultaneous-Equations Approach'," *Review Econ. and Statis.*, 36:88-92, February 1954.

[13] Harvey M. Wagner, "A Monte Carlo Study of Estimates of Simultaneous Linear Structural Equations," Tech. Rpt. 12, Dept. of Econ., Stanford Univ., 1954.

uct of this experiment, we have some concrete evidence of the kind of bias that may arise when we use the method of least squares instead.

In this experiment, a simple 3-equation model was formulated with known coefficients. Variables generated by the model were obtained and random error terms added to them. Two thousand observations were obtained in this way, and they were then divided into 100 samples of 20 observations each. The first equation contains 2 endogenous variables. Structural coefficients were obtained for this equation for each sample by the limited information approach, which I will discuss later, and by the method of least squares. Since there were 100 samples, 100 separate estimates of the single coefficient involved was obtained by each approach. Frequency distributions of these estimates are shown in section H of the chart, together with the true value of the coefficient. Each method gives estimates that are biased, but the 3 highest frequencies for the limited information approach are grouped about the true value, whereas the 3 highest frequencies for the least squares approach each are to the right of the true value. The *average* bias of the least squares estimates was almost 3 times as large as that for the limited information approach. This study was carried out at Stanford University by making use of a large-scale electronic computor. It is to be hoped that further experiments of similar character, with different sorts of models, will be undertaken.

In discussing methods that are used to handle equations that involve more than 1 endogenous variable, it is convenient to introduce a mathematical concept that deals with the *degree of identification*. We saw earlier that it is sometimes impossible to estimate the coefficients in certain structural equations with the kind of statistical data available to do the job. Such equations are said to lack identifiability or to be *underidentified*. Identifiable equations, however, may be *just identified* or *overidentified*. In the discussion that follows, we deal only with identifiable equations. The degree of identification relates to individual equations in a system, not to the entire system.

By algebraic manipulation, we always can write down the equations in a complete system so that the number of equations equals the number of endogenous variables. We then can think of these as n equations in n unknown endogenous variables, and we can always solve the equations so that each endogenous variable is expressed as a function of all of the predetermined variables in the system. These are called *reduced form* equations. Since each reduced form equation contains only a single endogenous variable, we can obtain estimates of the coefficients in these equations that are statistically consistent and efficient by use of the method of least squares.

If each equation in the system is just identified, there is always a unique transformation by which we can go from the coefficients in the reduced form equations to the coefficients in the structural equations. I am sure that many of you have seen this transformation for simple systems of equations, but perhaps it is worthwhile to run through an example to make sure that its nature is clear to everyone. Suppose that we have the following structural demand and supply equations, where q and p have their usual meaning, y is consumer income, w represents important weather factors that affect supply, and each variable is expressed in terms of deviations from its respective mean:

$$p = b_{11}q + b_{12}y \tag{2}$$
$$q = b_{21}p + b_{22}w \tag{3}$$

We have 4 variables in the system and 3 variables in each equation; since 4−3 equals the number of endogenous variables in the system minus one, we can assume that each equation is just identified. Several rules of thumb like this are available to determine the degree of identification; more exact rules depend on the rank of certain matrices.

If we substitute the right-hand side of equation (3) for q in equation (2) and the right-hand side of equation (2) for p in equation (3) and simplify terms, we obtain the following:

$$p = \frac{b_{11}b_{22}}{1-b_{11}b_{21}}w + \frac{b_{12}}{1-b_{11}b_{21}}y \tag{4}$$
$$q = \frac{b_{22}}{1-b_{11}b_{21}}w + \frac{b_{12}b_{21}}{1-b_{11}b_{21}}y \tag{5}$$

Since the denominator of each term on the right of the equality sign is identical, we can ignore these denominators for the moment. If we divide the coefficient of w in equation (4) by the coefficient of w in equation (5), we obtain an estimate of b_{11}. If we divide the coefficient of y in equation (5) by the coefficient of y in equation (4), we obtain an estimate of b_{21}. Given an estimate of b_{11} and b_{21}, we can estimate b_{12} from the coefficient of y in equation (4) and b_{22} from the coefficient of w in equation (5). This gives the 4 regression coefficients needed for our structural equations. Estimates that are uniquely equivalent are obtained by any alternative algebraic manipulation. Since the b's are known to be statistically consistent estimates, the estimates of the structural coefficients obtained in this way are statistically consistent.

Computationally, we may wish to estimate the coefficients in another way, but the answers obtained are identical to those that would have been gotten by an algebraic manipulation of the regression coefficients from the reduced form equations.

Let us now consider an equation that is overidentified. Suppose that our supply equation contains a second predetermined variable, z, that represents lagged values of prices. We now have 5 variables in the system. The supply equation still is just identified, since 5−4 equals the number of endogenous variables in the system minus one. However, the demand equation is overidentified, since 5−3 is greater than 2−1. The new reduced form equations can be obtained by the same general approach as used previously, but the result now looks like this:

$$p = \frac{b_{11}b_{22}}{1-b_{11}b_{21}}w + \frac{b_{11}b_{23}}{1-b_{11}b_{21}}z + \frac{b_{12}}{1-b_{11}b_{21}}y \qquad (6)$$

$$q = \frac{b_{22}}{1-b_{11}b_{21}}w + \frac{b_{23}}{1-b_{11}b_{21}}z + \frac{b_{12}b_{21}}{1-b_{11}b_{21}}y \qquad (7)$$

With this set of equations, b_{11} could be estimated either by dividing the coefficient of w in equation (6) by the coefficient of w in equation (7) *or* by dividing the coefficient of z in equation (6) by the coefficient of z in equation (7). Different answers are obtained from the 2 estimates. It is in this way that overidentified equations differ from just identified ones; for overidentified equations, we have an oversufficiency of information and no direct way to decide which answer to use. In fact, neither answer obtained by the use of reduced form equations is statistically consistent.

It would be possible to solve the 2 structural equations directly for the several coefficients involved by making use of a *maximum likelihood* approach. Maximum likelihood estimates are known to be statistically consistent and efficient. They are used widely in statistical work because the necessary equations always can be derived by performing certain mathematical operations that involve the maximization of the so-called likelihood function. The general approach is the same as for any maximization process by use of calculus and it is not difficult. For complex systems of equations, however, the mathematics involved in solving the resulting equations is generally complex. That part of Klein referred to in footnote 9 involved the derivation of maximum likelihood estimates. Methods for obtaining maximum likelihood estimates based on a simultaneous solution for all of the structural equations are discussed by Klein and in Cowles Commission Monograph 14 and are called *full-information* maximum likelihood estimates but, to quote Klein, the computations involved in general are "formidable." Hence this method is seldon used.

Another method, developed by staff members of the Cowles Commission, is called the single-equation *limited-information* maximum-likelihood method. In this approach, equations are fitted one at a time and information regarding variables that appear in *each* of the other equations

of the system is disregarded. Use is made, however, of all endogenous and predetermined variables that appear in the equation and of all other predetermined variables that appear in the system. This method is known to give estimates of the structural coefficients that are statistically consistent and as efficient as any other method that utilizes the same amount of information. A compromise between this and the full-information method is one called the limited-information *subsystem* method, in which selected groups of equations are fitted as a unit. Most of the systems of simultaneous equations that have been fitted and that involve overidentified equations have been based on the single-equation limited information approach. This is the approach that generally is meant when reference is made to the use of the limited information method.

For some applications of the limited information approach, I would like to call your attention to Cowles Commission Monograph 15 by Hildreth and Jarrett[14] dealing with the livestock economy; Iowa Research Bulletin 410 by Nordin, Judge, and Wahby[15] dealing with livestock products; and USDA Technical Bulletin 1136 by Meinken[16] on wheat. This approach has been used in several other studies, but each of these devotes considerable attention to broad methodological aspects.

Some Computational Considerations

If certain equations in a system of equations involve only a single endogenous variable, these can be fitted by the least squares approach. If other equations are just identified, they can be fitted by the method of reduced forms. If still other equations are overidentified, they can be fitted by the single-equation limited information approach. If the full information approach were to be used, all equations would be fitted simultaneously. But even if, in essence, each equation is to be fitted separately, similar computations based on the same data frequently are involved for each analysis. Hence considerable computational time may be saved by handling the computations as a unit. Even if several equations can be fitted directly by least squares and no other equations are involved, time frequently is saved by carrying out the computations as a simultaneous operation for the group. Whichever approach is used, the answer obtained is the same; here we are concerned only with computational efficiency.

---

[14] Clifford Hildreth and Frank Jarrett, "A Statistical Study of Livestock Production and Marketing," Cowles Commission for Research in Economics Monogr. 15, 1955.

[15] J. A. Nordin, George G. Judge, and Omar Wahby, "Application of Econometric Procedures to the Demands for Agricultural Products," Iowa Agr. Expt. Sta. Research Bul. 410, July 1954.

[16] Kenneth W. Meinken, "The Demand and Price Structure for Wheat," U. S. Dept. Agr. Tech. Bul. 1136, 1955.

If time permitted, I would give some concrete examples to illustrate this point. We have a computational handbook in which several such examples are discussed in detail.[17] This handbook includes the following: (1) A new method for handling ordinary multiple regression analyses. (2) Methods for handling equations that involve 2 or more endogenous variables, using essentially the same procedure for equations that are either just identified or overidentified. We discuss in detail the exact steps required for equations containing specified numbers of endogenous and predetermined variables and show how to obtain the coefficients and their respective standard errors. (3) The previously mentioned examples of complex systems of equations. (4) Tests that should be made after the analyses are completed, correlation concepts that apply to systems of equations, and the use of systems of equations for analytical purposes or forecasting.

Formulation of Models

In my opinion, there should be no question in the minds of research analysts as to whether they should use single-equation or simultaneous-equation methods for particular equations or groups of equations, but decisions must be reached regarding the complexity of the model to be used and the degree of aggregation. Klein has a useful suggestion here in connection with his discussion of *sector* models.[18] He suggests that a master model for the entire national economy be formulated. As I am sure most of you know, he and staff workers at the University of Michigan have made some progress in formulating models of this type. Models for individual industries, individual commodities, or individual regions can then be formulated and fitted as separate entities in such a way that they can be "grafted" onto the master model. Grafting of this sort is being carried out at the University of Michigan and elsewhere. In our work, for example, we have tended to treat variables that relate to the national economy, such as disposable income, as though they were predetermined. With Klein's approach, (1) the *computed* value of disposable income for each observation, based on the master model, could be used as a predetermined variable, or (2) disposable income could be treated as an endogenous variable and the predetermined variables on which it depends brought in as predetermined variables in the system for the sector. Either method yields consistent estimates, whereas the treatment of disposable income, as such, as a predetermined variable results in some bias.

The same general approach could be used in narrower fields. For example, we plan to fit some national aggregate simultaneous equation

[17] Joan Friedman and Richard J. Foote, "Computational Procedures for Handling Systems of Simultaneous Equations," U. S. Dept. Agr., Agricultural Handbook 95, 1955.
[18] *Op. cit.*, pp. 185-200.

models for the feed-livestock economy in which all feeds and all livestock and livestock products will be aggregated. The model will be similar to that used by Hildreth and Jarrett but will contain what we believe to be some important modifications. At the same time we will be fitting models that relate to individual feeds and to individual types of livestock, either for the country as a whole or for specified regions. Later, less aggregative models may be fitted for separate regions, with separate equations for each major type of livestock, and these regional models then could be grafted onto the master feed-livestock economy model, which in turn could be grafted onto a master model for the entire economy. Thus, over time, a series of studies could be built up, each of which would be manageable as a research unit, but all of which would tie together to make a united whole.

Concluding Remarks

I regret that time has not permitted the presentation of concrete examples of the formulation and use of simultaneous systems of equations, but the references which I cited earlier contain some excellent examples. A complete description of any one of them would have required at least the full time allotted to me. I hope that my remarks have cleared up some of the concepts and terminology used in this area by modern econometricians. In formulating and fitting complex models, the nonmathematician will do well to seek the advice of a competent expert in this area. Fortunately, our graduate schools are turning out an increasing number of such experts. However, it is my belief that anyone who is willing to give the matter careful thought can understand the basic concepts involved and can conduct applied research in such a way that he can use these concepts to advantage in his work with only the occasional help of a mathematician.

DISCUSSION: HOW MUCH PROGRESS HAS BEEN MADE IN THE STUDY OF THE DEMAND FOR FARM PRODUCTS?

WALTER D. FISHER
Kansas State College

These remarks will be offered within the context that Dr. Working has chosen: demand for farm products in relation to price. We are excluding studies, such as some budget studies, that ignore completely the price variable. Although for some purposes the omission of price in a demand study would be justified, it is true that in the field of agricultural products this is seldom the case.

Dr. Working has given us a broad perspective by tracing the historical development of demand studies over the last forty years or so. He has done well to stress the close relationship between completed empirical studies on the one hand, and the availability of data, theoretical concepts, and statistical tech-

niques on the other. I wonder if he might not have put greater emphasis on the accelerated rate of output of published studies in the 1950's as compared with earlier years. Some evidence of this development has been given us at these meetings two years ago by Kuznets[1] and last December by Foote.[2] My own browsing among the literature and bibliographies, although incomplete, leads me to make the following statement with confidence: the number of published empirical studies of demand of the type we are considering that have appeared in the last five years exceeds substantially the number in any previous five year period. I include foreign studies as well as domestic, and those of Stone in England and Wold in Sweden come immediately to mind. Of course, many persons here today have had a substantial part in bringing about this accomplishment.

Moreover, there has been a substantial advance not only in the sheer volume of work completed, but also in the quality and depth of the studies. As Dr. Working has pointed out, more attention has been given recently to sound methodology. For example, it is now quite generally recognized that for most policy decisions, such as price and output controls, introduction of new products, and so on—whether the decision-maker is government or private management—estimation of structural parameters such as elasticity of demand is necessary. As Dr. Working's pioneering article in 1927 pointed out, the elasticity of demand is not always equivalent to the regression coefficient of log quantity on log price computed by the method of least squares. Recognition of this difference led to the development of the simultaneous equations approach for estimating structural parameters. Some progress has been made in applying this technique, and in determining the situations for which it is needed.

In regard to Dr. Working's comments concerning differences between short-run and long-run elasticities of demand, I should like to remark that these terms are relative, as well as somewhat vague, and that the reaction time to be considered in a particular statistical study will depend on the uses that will be made of that study. In other words, I am in agreement with Dr. Working that we must consider a system of elasticities of demand, but I would also suggest that in describing this system the terms "short run" and "long run" be avoided.

Dr. Working's mention of the construction of general income indexes during the 1930's, such as disposable income or nonagricultural income, should be a healthy reminder to us who take these measures somewhat for granted that they were not always available to research workers. Also under this heading of development of new data, I believe it is appropriate to mention the recent establishment and expansion of the consumer panel operations such as those of the Market Research Corporation of America and of Michigan State College, which have stimulated new studies, and which promise to add a new dimension to our data, so that we will have not just time series *or* cross-section data, but time series *of* cross-section data.

In conclusion, I think it is fitting to ask the question: How can more progress be made in the study of demand? It is necessary to be quite brief.

First, our need is not for more data, but for efficient methods of dealing with the increased quantity of data that is becoming available. This applies also to fields outside of agricultural demand studies. Continued methodological research by econometricians and mathematical statisticians is called for.

[1] G. M. Kuznets, *Journal of Farm Economics*, 35:878-895 (December, 1953).
[2] Richard J. Foote, *Ibid.*, 37:197-206 (May, 1955).

For example, still more work needs to be done on the simultaneous equations approach. Dr. Working mentioned errors of observation. We need to have combined shock *and* error models developed, since most practical situations do not allow one to make *a priori* the assumption (necessary to make in order to use presently available techniques) that either shocks alone or errors alone are unimportant. It is noteworthy that Hood and Koopmans in a most recent account of the pure shock model[3] admit that no steps have yet been taken to demonstrate that in economic problems errors are less important than shocks. We also need more clarification of the assumptions implicit in postulating a recursive system of equations (or a system containing some recursive features). The discussion between Haavelmo, Wold, Frisch, and others at Uppsala, Sweden, last year[4] makes it clear that the last word is far from having been said on this subject.

Second, we need more communication among those who do empirical research and more continuity of research. I have often been surprised at how frequently writers fail to refer to work already completed by others in precisely the same field. It seems that such reference should be a normal responsibility of research workers.

Third, I sense some need for more specific formulation of the objectives that lead one to pursue demand studies. This point cannot be elaborated here. But it is not always clear why a particular demand study is being made, and it should be clear. The answers to many questions of technique depend greatly on who is going to use the results and for what purpose.

[3] Cowles Commission Monograph No. 14, New York: John Wiley and Sons, 1953, p. 118.

[4] Abstracted in *Econometrica*, 23:200-206 (April, 1955).

DISCUSSION: A COMPARISON OF SINGLE AND SIMULTANEOUS EQUATION TECHNIQUES

GEORGE G. JUDGE
Oklahoma A. & M. College

First, may I congratulate Dick Foote on his excellent economic and statistical comparisons of the single and simultaneous equations' techniques and on the objective and scientific manner in which he performed this task. Since I am substantially in agreement with his paper, I will direct my remarks to some general considerations of the estimation problem and in so doing indicate some minor areas of difference.

Since the advent of Haavelmo's[1] fruitful idea, which put forward a principle of fit that gave statistical expression to the interdependent schemes of abstract economic theory, economists have failed to achieve anything like a conscious agreement in regard to the problems of constructing sampling models that reflect the generation of economic variables and the corresponding appropriate method of estimating economic parameters. Some resolutely refuse (and perhaps wisely so) to estimate economic parameters from time-series data. Others have become suspicious of the application of least squares to time-

[1] T. Haavelmo, "The Statistical Implications of a System of Simultaneous Equations," *Econometrica*, Vol. 11, 1943, pp. 1-12.

series data and have voiced the opinion that the use of the simultaneous equation technique is generally safer, since the likelihood of bias arising from treating certain variables as approximately exogenous is diminished. Still others, some of whom are aware of the objections to least squares, use this as their principal vehicle for estimation or as mentioned in Foote's paper, present arguments for cases in which the least squares method may be approximately appropriate. In this connection it is interesting to note that although certain investigators have agreed on the appropriateness of least squares for certain investigations, agreement has not been forthcoming on the choice of the variables to play the dependent role (e.g., is it price or quantity). Granting that a state of uncertainty exists about the correct statistical formulation for various economic investigations and that our information is imperfect, as to the cases in which least-squares error (bias, plus sampling error) in small samples is large enough to make this method inferior to others, it does appear that to a large extent the differences of these groups have not been reconciled in terms of the issues of basic philosophy. Everyone, it seems, thinks that he is correct and has gone his own way. As a result our system of communications so vital to scientific advance has faltered.

This skirmish among groups emphasizing different methods may be leading us away from the heart of the economic problem, namely, that of constructing economic models that will accurately reflect the phenomena observed in the real world. The restrictive and expository assumptions of the methods under discussion were bared for the world to see when their likelihood functions were written down and the procedures for estimating the coefficients were derived. Given this, along with the fact that these formal estimating procedures are only tools for reflecting the judgments of the investigator, it would seem that the major disagreements of economists should be with the economic models rather than with the method of estimation. A common sense approach to estimation might be that of constructing the economic model independent of the method of estimation. Then if logic free of emotion is used as a strict criterion, and the investigation is carried forward by matching the assumptions of the model with those of the method, a major step will have been taken toward a common approach to the problem of parameter estimation. Interdependency is obviously very usual and if a set of data are generated by an interdependent model we cannot turn our back to this. Correspondingly if the assumptions underlying our economic model are reflected by "least squares" we should, of course, use this method. However, a decision must rest on economic criteria.

In regard to the identifiability criteria in linear models Foote has presented an example showing how identification was achieved at least according to his classification and location of the different variables in the system. However, it should be kept in mind that this is only a necessary and not a sufficient condition for identification. In order to fulfill both the necessary and sufficient conditions for identification in a linear model, not only must a sufficient number of the postulated exogenous variables appear in the system, but from these variables we must be able to form at least one non-vanishing determinant or order (G-1) out of these coefficients, properly arranged (where G is the number of endogenous variables appearing in the structural equation to be estimated). Otherwise, if some of the variables appeared with zero coefficients, they would contribute no information and in the strict sense identification might not be achieved. The likelihood ratio test for over-identifying restrictions is of some

value in checking the specification of the model but may have limited usefulness in some applications (e.g. when the abbreviated variant of the limited-information method is used). It should also be noted that the problem of non-linear models has hardly been attacked and the identification of non-linear models has never been solved.

At the present stage of development in the application of estimation methods to either a single equation or systems of equations, the discussant considers the problems concerned with the specification of the model to be pre-eminent. This problem is important (1) since any statistical inference regarding indentifiable parameters is conditional upon the validity of the specification of the model, and (2) since most economic data are of a nonexperimental nature, and so one cannot make his data conform to a previously selected model.

Economic theory and observation can be used as a qualitative aid in the selection of variables to enter each equation and in the classification as to whether they are endogenous, exogenous, or reflected in the disturbance variable. However, theory presents us with a large class of admissible hypotheses for any particular investigation, and it should be realized our theory of relative prices is almost entirely a static theory—a theory of position rather than movement. As such it abstracts very largely from those dynamic phenomena that are our main concern in constructing a model reflecting economic change. Also the logic provided by economic theory only specifies some very general properties of the functional form of the equations, and thus one must make additional assumptions as to the specific algebraic form and the stochastic properties underlying the postulated system of equations. In addition the sample data usually employed are consistent with a host of hypotheses. To be sure there is no best way to attack this problem of model specification and it is at this juncture in parameter estimation that the art and judgment of the model builder are most acutely tested.

Within this problem of model specification one of the key concepts in the literature of estimation methods is that of the "exogenous" variables. In regard to lagged endogenous variables their exogeneity has often been taken for granted and we have used lagged prices and incomes in many of our models, rejecting current prices and income on the grounds that they are thought to be correlated with the shifts in the equation. Yet if one examines the series in question he often finds that the lagged values of the variables are so highly correlated with their current values as to be almost the same series. In such cases it is difficult to see how the lagged series could be exempt from the criterion regarded as decisive in the case of the current series. In regard to potential exogenous variables the departmental and casual principals are usually applied in determining which variables are set aside as exogenous. Although precise economic definitions may be formulated and there exists a statistical criterion by which a variable is called exogenous if certain assumptions are met, in most applied analyses the final classification is conditioned by the knowledge of the investigator about the generation of the variables and the assumptions he is willing to make. This puts a large weight on logic since the choice that evolves affects the number of equations contained in the model, the method of estimation and the resulting parameter estimates. Although I may have exaggerated the darkness of the situation, the moral seems to be clear: Sole reliance cannot be placed on the exogenous variable concept as our choice indicator in estimating economic parameters.

In order to clarify and expand some of the problems encountered in model specification, I shall draw upon a study conducted with Ted Booth, now at Vanderbilt.[2] This study employed a basic model similar in size and structure to that used by Girshick and Haavelmo in their study of the demand for food.[3] In order to ascertain the impact of model specification, several models varying in size, variable classification and functional form were constructed so as to simulate the different models that might be constructed by investigators pursuing this same estimation problem. The resulting estimates of the parameter of the price elasticity of demand for food from these admissible hypotheses varied from $+0.27$ to -0.70. Keep in mind that the alternative models that may be viewed as equally plausible resulted in large variations in the parameter estimates with only minor variations in the general model (e.g. deletion or addition of an exogenous variable in a theoretically autonomous equation). Results such as these are of little comfort to the economic statistician engaged in the specification and estimation of economic models, and the results make explicit the degree of arbitrariness inherent in the specifications of models constructed to describe economic behavior. Since there are many models that could lead to the same reduced form it would certainly be arrogant to assert that one of these models is *a priori* the true one. In this day of multiple models and estimates one can always hope that theories will be kept consistent with available evidence by subjecting conflicting judgments to real tests of prediction.

There are many areas in economic research where an estimate of the parameter within a certain range is all that is needed. In this connection I would like to mention an idea advanced by Arnold C. Harberger at the meeting of the econometric society in September of 1954.[4] Harberger in his paper demonstrated how, by classiying shifts of economic relations *a priori* plausible and implausible, the possible range of estimates for certain parameters can be narrowed to rather usuable limits. Although, if the observations of the past hold true, we as economists could hardly be expected to agree on a criterion for plausibility, this paper does indicate how by using very simple tools we may in some instances be able to obtain parameter estimates satisfying our needs. When we consider the pitfall of specification bias, and the problems of aggregation and errors in the data we use to reflect the variables of our economic models, it is conjectural whether or not in some cases we can do better by using our formal statistical techniques.

If we have learned any overall "lesson" during the large number of years elapsing since H. L. Moore's pioneering efforts at estimating parameters, it appears to be the following: In the task of estimating economic parameters, almost any chain of choices leading to inference rests essentially on subjective judgments. Formal estimating procedures are only tools for use in screening multiple possibilities among a group of admissible hypotheses. They can serve us only to the extent that they successfully reflect our subjective judgments or choices.

---

[2] G. G. Judge and E. J. R. Booth "The Impact of the Choice of Model On Economic Measurements," Journal paper, Storrs (Conn.) Agricultural Experiment Station.

[3] M. A. Girshick and T. Haavelmo, "Statistical Analysis of the Demand for Food," *Econometrica*, Vol. 14, 1947, pp. 79-110.

[4] A. C. Harberger, "On the Estimation of Economic Parameters," paper delivered before the meeting of the Econometric Society in September, 1954.

DAIRY PRODUCTION AND MARKETING PROBLEMS

Chairman: Hugh L. Cook, University of Wisconsin

THE IMPACT OF TECHNOLOGICAL CHANGES ON MILK PRODUCTION[1]

R. G. WHEELER[2]
Michigan State University

THE sequence of topics on our program this afternoon suggests that technological changes in dairying are leading to marketing problems. Examples of technological change are plentiful, but it is no easy matter to speculate even in a qualitative way about their effects on the supply functions of various dairy areas, and on various kinds and sizes of dairy farms.

There may even be some difficulty in reaching agreement about what to include as technological change. Most economists would probably expect to include any developments affecting the level or shape of the production function in dairying—developments, in other words, that would permit the attainment of greater outputs from given inputs of resources. When techniques change because of changing price relationships, however, the situation is not so clear. Does the substitution of machinery for labor represent true technological change even when there has been no shift in the underlying production function? And what about the many borderline cases where existing know-how has been incorporated in the design of implements which find a market mainly because of new relationships among factor prices? As early as 1913, for example, it was technically possible to produce a usable field forage harvester, yet this implement was perfected and marketed in quantity only after substantial changes in the relationship between labor and machinery prices. Perhaps the range of technical possibilities for the industry as a whole did not change very much over this period, but the production function on the individual dairy farm certainly changed in some measure when forage choppers became readily available on the market.

A liberal definition of "technological change" will be convenient for present purposes. Hence, the term will be assumed to include any influences, apart from the direct effects of price changes, which alter the nature of the various short- and long-run cost curves for the individual farm business, as known to the operator. If the operator begins to behave as if new techniques had become available, the impact will be the same

---

[1] Journal Article No. 1801 of the Michigan Agricultural Experiment Station.

[2] Thanks are due to C. R. Hoglund and L. H. Brown for reading the first draft of this paper and suggesting improvements.

if his actions result from actual changes in the production function, or if merely from improved knowledge of the old one.

Kinds of Technological Change

Under this sort of a definition, the last few years have certainly brought many technological changes in dairying. Some of the more spectacular developments relate to the production and preservation of feed crops for the dairy herd. Today, typical dairy farmers in the Northern Dairy Belt produce 30 to 50 percent more feed units than they did 15 years ago, and they do it with 10 or 20 percent less labor.[3] Increased use of fertilizer, more emphasis on high yielding crops, and other yield-increasing practices account for much of the additional production. Increased yields also help to account for the fact that labor inputs have not increased in proportion to output. Of even greater importance, of course, has been the almost complete shift to tractor power and tractor equipment.

Altogether, northern dairy farms have almost doubled their physical inventories of power and equipment during the last 15 years. In many cases, the savings in man-hours would hardly pay for the additional equipment expense, but other gains have often been possible. Outstanding among these has been the improvement in roughage quality achieved through earlier harvesting of grass or legume stands. Forage choppers have made it practical to harvest large quantities of grass silage at times when it would be almost impossible to make top quality hay in the field. Barn driers are also helping to preserve a larger fraction of the nutritive value of green forage. Even when hay is cured in the field, the job can be completed at an earlier date because of the additional equipment available. In terms of nutrients preserved for feeding to dairy animals, therefore, the calculated increase in feed unit production actually understates the gains that have been made.

The widespread adoption of artificial insemination also promises to have important long-run impacts on the use of resources in dairying. Nearly a fourth of all dairy cows in the country were artificially bred last year. Resources formerly used for maintaining bulls on farms are now available for keeping more cows, and replacement animals from superior sires are becoming more and more numerous in dairy herds.

There have also been important developments in facilities and techniques for housing dairy cattle and performing dairy chores. Although dairymen were completing the shift to machine milking during the 1940's, they were also adopting other mechanical devices and improved methods to speed up chore work. The techniques of "fast milking" were widely

[3] Estimates derived from data in *Farm Costs and Returns, 1953*, Agr. Inf. Bul. 128, Agr. Research Service (Washington), June 1954.

studied, and other work simplification practices were accepted. Equipment manufacturers began to distribute gutter cleaners in quantity, while both silo unloaders and self-unloading silos appeared on the market. With these developments, increasingly high labor accomplishments became possible in conventional barns. The cost of replacing such buildings, however, was high, and there was a real need for alternative ways of housing cattle with less capital outlay. Interest, therefore, reverted to the older technique of loose housing, using buildings of relatively inexpensive construction.

Many of these plants were not very satisfactory, but they did point up the advantages of developing a specialized milking parlor and pipe-line milker set-up that could provide nearly ideal conditions for performing the most crucial part of dairy chore work. Devices for self-feeding roughages are also being perfected. Thus, it is now possible for labor accomplishments under loose housing to equal or exceed those that can be attained under careful management in a well-designed conventional barn. Achieving such accomplishment levels under loose housing requires a moderately expensive plant, yet not as expensive, ordinarily, as conventional housing. In similar fashion, trench, bunker, and stack silos have provided low investment alternatives to the conventional tower silo.

Impacts on Dairy Feeding

As a consequence of developments mentioned earlier, it is now feasible and economical to provide dairy cows with forage of much higher quality than that which they were fed a few years ago. Part of this high quality forage is grazed from improved pastures. Part of it is harvested as early cut hay, frequently cured on a drier, and much of it is chopped for the silo or for feeding direct from the field. Under these circumstances, the economy of heavy grain feeding is doubtful. When cows are fed along the stomach capacity line, any substantial use of grain is at the expense of roughage consumption. The higher the nutritive content of the roughage, of course, the less advantageous it will be to allow the substitution of grain for roughage in the combined ration. Offsetting these developments, at least to some extent, are the very considerable gains that have been achieved in the economy of grain production. But relatively cheap grain is more of a reality for the midwestern dairyman who grows his own than for the northeastern dairyman who depends upon purchased rations. Thus, the northeastern dairyman in particular has much to gain from improved roughage quality.

Impacts on Specialization in Dairying

When cows were milked and hay was pitched by hand, diversification

offered a number of advantages and few serious disadvantages on farms with dairy herds. A number of dairymen were willing to face the job of milking 15 or 20 cows day after day, but many found it preferable to combine other enterprises with a relatively small dairy herd. As expensive, specialized equipment has come into use, however, the advantages of concentrating attention on the dairy enterprise have increased while some of the drawbacks have been removed. Thus, there has been a noticeable trend toward specialization in dairying in the last few years, and there are strong reasons for expecting this trend to continue.

Bulk handling is one of the recent developments likely to give an added push toward greater specialization. A considerable number of milk handlers are likely to press for adoption of this practice in the near future. If bulk tanks are installed on diversified farms with small dairy herds, they will provide an added incentive for increasing milk production at the expense of other enterprises. Other dairymen, not prepared to expand their herds beyond the 10- or 15-cow level, will give thought to shifting out of dairying before investing in bulk tank installations. Both kinds of adjustments will tend to increase the degree of specialization in dairying.

In this context, the production of feed crops for dairy herds must be considered a part of the business of dairying. Recent developments affecting the production and utilization of forage crops may even tend to increase the advantage of keeping dairy animals on the same farms that grow the feed for them. The expense of transporting any kind of silage or green forage over sizable distances would of course be prohibitive. It has already been suggested, moreover, that northeastern dairymen may come to rely to a greater degree on home-grown forage and less on purchased grain.

Impacts on Size of Business

Technological developments and increasing output per farm have tended to go together so much in the past that we sometimes regard them as inseparable. Logically, however, there seems to be no compelling reason for this to be true. Many types of technological change may indeed lead to increased output, but others may lead primarily to greater economy in using one or more of the factors of production, with or without any appreciable increase in the output of the firm. The outcome will depend at least in part on the nature of the changes in the firm's entire cost structure.

We may think of the cost structure of the milk-producing firm as a whole array of cost schedules or curves for alternative plants varying in size, design, and operational practices, with each plant offering the most advantageous way of producing at one or more specified levels of output. A particular technological development may affect the level or shape of

any one or a number of the individual plant curves comprising the firm's entire cost structure. In the process, it may also affect the location of one or more points on the firm's long-run cost curve. In general, the question of whether or not a given technological development is likely to result in increased output from the firm will depend upon how it affects the relationship between marginal revenue and long- or short-run marginal cost.

In the past, farm management surveys have repeatedly demonstrated that dairymen with larger herds ordinarily achieved higher incomes. More significantly, most budgeting under long-range assumptions, such as the studies by Fellows, Frick, and Weeks[4] in New England and by Hoglund[5] in Michigan, also suggests constant or increasing returns as size of unit increases.

In terms of the long-run cost curve for units ranging from 15 to 150 cows in size, many cost elements increase in more or less direct proportion to cow numbers, This is apt to be very nearly true for total feed costs, for building costs, for the labor involved in chore work, and for miscellaneous dairy expenses. As herd size increases, an increasing distance is likely to separate the farmstead from the fields used for forage production. Large dairy units, on the other hand, have some clear-cut opportunities for making more effective use of machinery than small dairy farms. Altogether, the tangible reasons for expecting major deviations from constant costs are far from impressive.

Thus, under assumptions that permit an operator to earn a little more than hired man's wages for his labor and a reasonable rate of return on his capital, it has always been difficult to show why he could not afford to enlarge his business to two-man, three-man, or some larger size, given unlimited access to capital. It can hardly be argued that recent developments have reduced the advantages of large units. Such diseconomies as may exist for relatively large-scale dairy units are mostly of rather intangible nature, unless one chooses to emphasize the problems of coordination, which increase much more rapidly than in proportion to the size of unit.

Even if we knew exactly how recent technological changes have affected the shape of the long-run cost curve, however, the significance of the information would be open to question. Inasmuch as the long-run cost curve is composed of points or segments from cost curves for a number of individual plants, it represents a fully realistic series of alternatives for

[4] I. F. Fellows, G. E. Frick, and S. B. Weeks, *Production Efficiency on New England Dairy Farms—2. Economics of Scale in Dairying*, Storrs Agr. Exp. Sta. Bul. 285 (Storrs) 1952.

[5] C. R. Hoglund, *Economy of Improved Production Practices on Specialized Dairy Farms in Southeastern Michigan*, a processed report of the Michigan Agricultural Experiment Station in cooperation with the U. S. Dept. of Agr. (East Lansing) 1952.

the farm operator *only* when he is uncommitted to any of the fixed costs associated with a particular plant. A new producer, starting from the zero-output, zero-cost level, may be able to choose the appropriate plant for producing at any desired point on the long-run cost curve. Once committed to this plant, however, he will probably be saddled with certain costs that he can scarcely avoid if he later wishes to shift to a new level of output. Small plants can often be converted to larger ones, of course, and furthermore the fixed costs associated with any particular plant becomes variable over a long time span. For operating dairymen, however, the range of practical production possibilities is usually much more restricted than indicated by the long-run cost curve.

The commitments that limit feasible adjustment possibilities on operating dairy farms include investments in more or less unique combinations of land, buildings and long-lived equipment. Typically, these plants are at least loosely adjusted to the capabilities of a regular labor force consisting of one, two or three workers. In the Northeast a few years ago, for example, there were many dairy farms with a two-man labor force and about enough land, buildings, and equipment for keeping a herd of 30 or so cows. An even larger number of units corresponded rather closely to a one-man, 14-cow pattern. There were also a number of farms with a three-man labor force and other resources for keeping about 45 cows. The last few years have brought a general increase in the number of cows per man, but the same general patterns of resource combinations are still to be found. Thus, it is realistic, though not entirely unambiguous, to speak of one-man, 20-cow farms; two-man, 40-cow farms; and three-man, 60-cow farms. These designations identify plants with certain combinations of costs that are more or less fixed for considerable periods of time.

In such a context, rising marginal costs may be encountered at a rather early stage in expanding production on the typical two- or three-man farm. Expanding the roughage supply, for example, may involve a succession of steps such as increasing the fertilization of existing cropland, clearing additional land, renting or buying land, and importing hay from a distance. Remodeling buildings to care for more livestock without sacrificing labor efficiency may become increasingly difficult.

For these and other reasons, our 241 case studies of New England dairy farms[6] revealed only 34 units where it seemed advantageous to plan on increasing the business enough to warrant employing an additional full-time worker. The labor force on 16 of these 34 farms was actually increased according to plan within a period of about three years. During the same period, however, a number of businesses changed hands or

[6] See R. G. Wheeler and J. D. Black, *Planning for Successful Dairying in New England*, Cambridge: Harvard University Press, 1955.

went out of production entirely, and still others reduced the size of the regular labor force. The net change in the group having three or more regular workers was an increase of one farm, while the total number of operating farms decreased by a little more than five percent. Obviously, any decrease in the total number of operating units would be expected in the smaller size groups. There was little indication, however, that one-man units were disappearing any more rapidly than two-man units.

The limitations imposed by present commitments in existing plants have become more acute with the increase in cow numbers per man. Consolidation of land holdings, to be sure, is taking place at a fairly rapid rate, while new and larger buildings are replacing older ones. But current technological developments may lead some dairymen, at least in the short run, to reduce the number of regular workers instead of increasing herd size. This is particularly likely where the competition of off-farm jobs is becoming increasingly sharp. Thus, some of the three-man, 60-cow dairies may take advantage of new technology to become two-man, 52-cow units. This, in fact, is a sort of adjustment that took place on a number of the New England Dairy Farm Management Project farms during the first three years of working toward adoption of the revised plans.

Elsewhere in the northern dairy belt there seems to be equally little evidence that the size of the regular labor force on dairy farms is tending to increase. Dairy farms are becoming larger in terms of cow numbers, partly because some farms are expanding and partly because many operators of small units are withdrawing from dairying. To a lesser extent, dairy farms are becoming larger in total acreage as the process of unit consolidation continues to take place. In many cases, however, more cows are being kept on the same acreage of land through an intensification of crop production methods and through other changes in farm organization, including greater specialization in dairying.

Impact on Capital Needs

One of the most serious technological impacts has been on the amount of capital needed for an effective dairy farm operating unit. Quite apart from the increase in price levels of the last 15 years, the amount of capital to keep one man effectively employed in dairying has increased by something like a third to a half. Percentagewise, the largest increase has been in machinery investment, but more capital has also been needed to permit keeping more cows per man and to provide the buildings and additional land or land improvements to house and feed the larger herds. This has been another factor tending to limit farms to one- or two-man size.

Impacts on the Geographic Distribution of Milk Production

New techniques in dairying will almost certainly tend to reduce the advantage of using relatively unspecialized equipment and facilities to care for small dairy herds on diversified farms in areas distant from city markets. If these dairymen add more equipment, invest in new buildings, and enlarge their herds, they will be able to produce milk to meet the sanitary requirements of city markets about as cheaply as if they were producing milk for manufacturing. Developments in the transportation and handling of milk also may lead to a higher degree of competition between distant and nearby producers. As a result, the structure of prices between fluid and nonfluid supply areas may become more nearly continuous. The outcome, of course, will depend upon alternatives to dairying in both the distant and nearby areas. On the whole, it seems reasonable to expect more change in the peripheral areas than in the areas close to city markets.

Impacts on the Problems of Management

Technological changes will exert whatever influence they may have on milk production through the decisions of thousands of individuals who manage dairy farms. The more rapid the pace of technological developments, the more complicated will be the problems facing dairy farm operators. No dairy farmer today can afford to imagine that his principal job is that of a farm laborer or mechanic. Ability as a mechanic is perhaps much more necessary than it was a few years ago, but neither brute strength nor mechanical genius will keep a farm business successful in an environment of technological progress and changing demands.

On individual dairy farms, the problem of evaluating the suitability of new technological developments is particularly difficult. In many cases, the productivity of inputs for crop production can be realistically measured only in terms of outputs of the livestock enterprise. Each new development needs to be evaluated in terms of its effect on the total success of the individual farm business. Thus, the current emphasis on education in the problems of operating-unit planning is appropriate at a time when new technological developments are appearing at an accelerating rate. Even to keep abreast of information on the potentialities of new machines, new crop varieties, new techniques in using fertilizer, and other new production practices is no small job. Determining how much of the new technology to adopt for maximum economic success on the individual dairy farm will call for an increased proportion of the operator's attention.

Summary

It seems fair to conclude that recent technological developments are leading to a higher degree of specialization on dairy farms and to increasing output per farm, but not to any significant increase in farm size as measured by the number of workers in the regular labor force. In city milk markets, the intensity of competition between nearby and distant producers is likely to increase, with peripheral areas accounting for more than a proportionate share of any change in total production. Even at constant prices, the amount of capital needed per man has been increasing substantially, and the proportional importance of capital and management inputs have been gaining relative to labor inputs.

THE DAIRY PROBLEM AND A SUGGESTED SOLUTION*

HERBERT C. KRIESEL
Agricultural Marketing Service

I

THAT a dairy problem exists in the United States is generally agreed. As to the exact nature of the problem, there is less agreement. There is still less agreement concerning remedial measures that might be adopted. Many of the proposals that have been used and several others that have been suggested, appear to be more in the nature of interim measures designed to ease some of the effects of the problem and thereby enable us to live with it rather than to deal with causal elements. The description of the dairy problem as presented in this paper suggests that there is one basic acceptable solution. I have taken the liberty, therefore, to amend the assigned title to read "The Dairy Problem and a Suggested Solution."

The dairy problem is commonly thought of as merely the production of a greater quantity of milk at support levels than the American people are willing to consume at retail prices equivalent to those levels. It is easy to say that the problem is of our own making, that political considerations—in both the legislative and executive departments of government—have not permitted prices to decline to the equilibrium level. If this were all there were to the matter, it would be valid to conclude that there would be no dairy problem if politics had not entered the picture. It will be shown later that the dairy problem is considerably more far-reaching than that. This is apparent from the fact that at present support levels we have both a surplus of milk products and relatively low returns to farm resources engaged in milk production. It is apparent that the problem may not be caused by government any more than it is remedied by present programs.

Although complete avoidance of the surplus milk products is not a sufficient condition to solve the dairy problem as herein described, it is nevertheless of some interest to consider the magnitude of the present excess supply. In an effort to strengthen the domestic market, the U. S. Government has purchased at least some dairy products in each postwar year, beginning with 1947, except in 1948. In some of these years mainly nonfat dry milk was purchased. Butter and cheese were purchased in volume in 1949 and 1950 and rather consistently since late November 1952. The largest quantity of milk equivalent purchased in a 12-month period was 11 billion pounds in the marketing year ended March 31, 1954. In the marketing year ended this last March 31, purchases, on a fat solids

* The views expressed in this paper are those of the author.

basis, were equivalent to 5¾ billion pounds. (Farm marketings of milk in the last 3 years have averaged a little over 100 billion pounds.) A substantial part of these purchases was channeled back into domestic outlets, such as the School Lunch Program and certain welfare uses, mostly noncompetitive outlets. In the absence of the support program, prices to farmers for milk probably would be 30 to 40 cents per hundredweight, around 10 percent, below prevailing levels.

The price-raising effects of the dairy price-support program were greater in 1953 and 1954 than they are this year. Nevertheless, in both those years, as in 1955, returns to operator and family for labor and management are below what they are on several other types of farms, and considerably below rates paid for comparable work in the non-agricultural sectors of the economy, even after allowing for the perquisites available to farmers.

Actual survey data are not available that would indicate returns per hour (or some other unit of time) to the operator and family for labor and management engaged in different types of farming. However, data calculated for the so-called typical farms, published by the Agricultural Research Service in its annual series "Farm Costs and Returns" are helpful on this point.[1] For recent years, these calculations show relatively lower returns on dairy farms than on most other major types of farms. The most consistent exception has been cotton farms in parts of the South. Dairy farmers, of course, work a greater number of hours than do people on most other types of farms, so that the annual return compares more favorably. But dairy farmers, too, are coming to place a greater value on leisure, and therefore it is quite significant that the calculated return per hour to operator and family for labor and management has been in the neighborhood of $.50 in past two years or so. Most Corn Belt farms in different combinations of livestock enterprises and cash grains, on the other hand, have realized in excess of $1.00 per hour. The above calculations on per hour returns exclude normal rates of return to capital. Dairy farms, of course, require a relatively large fixed investment. But even if all returns to capital were attributed to labor, the per hour rates would be less than $1.00.

These relatively low returns for human effort are immensely a more important aspect of the dairy problem than is the moderate-sized, fluctuating surplus at existing support levels.

We might say for the moment, that a twofold reason exists for the comparatively low returns to people for their labor and managerial efforts in dairy farming: (a) low unit value of the product at the farm level and

[1] *Farm Costs and Returns, 1954, With Comparisons,* Agriculture Information Bulletin No. 139, Wylie D. Goodsell and Associates, Agricultural Research Service, USDA.

(b) low productivity of labor and management resources on dairy farms.

Most action programs to date have been designed to remedy the problem by dealing with reason (a). These programs have tended to limit the supply available to consumers, though some measures have been designed to increase demand. The purchase phase of the present purchase and diversion program has the effect of limiting supplies to consumers and raising the price on the entire quantity they purchase. Disposition of stocks acquired has become a major problem. Other kinds of programs have been of demand-increasing variety. This is the nature of the School Lunch Program, and food stamp programs, as examples.

Currently receiving widespread support is an unprecedented effort to advertise dairy products. Through this effort it is hoped that demand will be permanently increased; that present surplus will be purchased in commercial market and that some time in the near future consumers will be willing to pay a relatively higher price for a given quantity of dairy products. To the extent that advertising contributes to a better appreciation of the real importance of milk in the human diet, it is in the nature of an educational effort and probably can be justified. In the short run, it is conceivable that advertising in the narrow sense might even bring a significant increase in purchases. But the effects of advertising one food as against another would tend eventually to be mostly offsetting. Successive increases in advertising efforts by each segment of the food industry may in fact merely lead to increases in total marketing costs. For a food industry already in trouble, with what many consider as too large marketing costs and low returns to farmers, one might question whether or not it is reasonable to consider advertising as a promising remedy for the problem confronted. Unfortunately, the research needed to conclusively answer this question has not been done, nor is much underway.

Improved merchandising is quite another matter. Making milk more readily available to consumers should help to increase its purchase. Most of us no doubt have attended functions recently at which milk was neither served nor conventionally available for purchase. Introduction of new retail pricing practices or broadening use of some now employed would seem to offer help in increasing sales of dairy products.

Raising of dairy product prices, by limiting supplies or increasing demand, has had much less effect on net income to labor and management on dairy farms than appears possible to realize in many cases by improving the organization of farms. In the current marketing year, the Commodity Credit Corporation is supporting prices to farmers for manufacturing milk and butterfat at 80 percent of parity equivalent and 76 percent of parity, respectively. To achieve this, around 5 percent of farm sales are being purchased. In the absence of support this year, prices to

farmers for manufacturing milk probably would average around 70 percent of parity equivalent, or about $2.75 per hundredweight compared with the objective of $3.15 for 3.95 percent milk. To a typical 2-man dairy farm in southeast Michigan, with average cows, selling approximately 1,850 hundredweight of milk per year, an increase of 40 cents per hundredweight would have the effect of raising annual cash receipts $740.00. The dairyman's cost structure may not be greatly altered by any changes in the dairy support program, so that the net income would be increased about as much. Raising the support to 90 percent of parity, maximum permitted under present law in absence of an emergency, would result in an increase of about $740.00 per year over present levels. An increase to 100 percent of parity probably would add an additional $720.00 per year, making a $1,460.00 increase over that now prevailing. On many farms, increases of these magnitudes at present time no doubt would mean sizeable percentage increases. But considering the number of hours worked, even the maximum increase would fall considerably short of remedying the disparity with nonagricultural pursuits. Reorganization of the same 2-man farm in southeast Michigan to include better feed crop systems, better cows and larger total output per farm, when effects are fully reflected, would increase gross receipts by $9,000.00 per farm at an additional annual cost of $2,000.00, giving an increase in net income of a little over $7,000.00 per year.[2] The increase in investment needed to accomplish this has been calculated to be only about half the increase in net for a single year. These estimated effects may be subject to considerable error. But in any case, the increase in net would clearly exceed the maximum that would be realized by raising price supports. And these calculations make no allowance for effects on other parts of population, especially consumers.

Efforts to increase the productivity of farm resources utilized in producing milk have been confined mainly to educational-type programs conducted by land grant colleges in cooperation with USDA and by commercial farm-supply firms. Some action-type programs, such as the activities of the Soil Conservation Service, also have played an important role. Many of these efforts, however, have been concerned more with increasing the output of certain products per unit of input in some physical sense than they have with the alteration of the entire farm organization.

Outlined below is a suggested program involving positive government aids to help achieve a greater marginal value product for labor on dairy

[2] These illustrations, using a typical southeast Michigan farm, and assuming medium price level, are taken from "Economy of Improved Production Practices on Specialized Dairy Farms in Southeastern Michigan," Michigan State College in cooperation with USDA, April 1952, by C. R. Hoglund.

farms. Proposals of this general nature have been advanced by many other economists, usually with reference to the agricultural adjustment problem as a whole.

II

Before considering a concrete solution to the dairy problem, it is desirable to set forth certain characteristics of, and developments in, the dairy industry:

1. The demand for milk fat has been declining in several uses, including butter, fluid cream, whole milk, and ice cream, though there has been an upturn in consumption for some items in the last year or two. In all probability the demand for milk fat will decline further, enabling consumers' needs for milk to be met with a relatively smaller supply of milk, measured on a fat solids basis.

2. Use of solids-not-fat component of milk has been increasing over the years. This is coming from several directions, such as fluid milk drinks, some of the cheeses and low-fat ice cream. There is every indication that this uptrend will continue. Continued expansion in the use of this product will help to reduce the surplus phase of the dairy problem. However, real price-raising effects of increases in consumption of this item will be delayed for some time, since one-fourth of the quantity produced is still not used domestically for food.

3. The income elasticity for milk products is relatively low, especially for fluid milk. This is apparent in the form of small increases in consumption compared with increases through time in consumer incomes or from family budget data relating consumption and incomes. Many people consider that they are already getting enough milk products, so that increases in incomes go to other items, mostly services and nonfood commodities.

4. The price elasticity of demand for most dairy products is low also, at least in the short run, and especially for fluid milk. Practically, this means that there is relatively little response to a drop in price at the consumer level but that increases in supplies bring relatively large price reductions.

5. Most advances in dairy farming efficiency have the effect of increasing total output. Continuation of dairy prices to farmers at present percentages of parity probably would lead to a gradual increase in milk output. The increase in demand (from larger population and larger per capita incomes) will tend to result in the use of more milk but it is probable that the increase in demand will continue to be outdistanced by the gain in milk supply in the next several years. With farmers' demonstrated ability to produce feed concentrates and roughages, and with other technological advances in dairy farming, it is not unlikely that the milk surplus of this year may be exceeded in several years during the next decade.

6. Gross marketing margins on dairy products are substantial and the income elasticity for most services exceeds that for milk products themselves.

7. The U. S. price level for dairy products is substantially above what might be considered the world market. Import quotas would need to be continued for many years in order to minimize domestic adjustment problems. On the other hand, there is little opportunity to expand exports of U. S. dairy products.

8. Nutritional qualities of milk and many of its products may justify special government activities to increase consumption. This may apply to school lunches and other sectors of the population which, for reasons of some handicap or other consideration, may be consuming less milk than is considered desirable in the national interest.

It is necessary, also, to set forth explicitly certain assumptions about farm people. First, it is assumed that the dairy farmer segment of the dairy industry (as well as processing and distributor groups) desires that the farm segment of the dairy industry shall function as completely as possible in the competitive system without permanent direct aid of government which now prevails. Secondly, it is assumed that a sufficient number of people would be willing to shift to nonfarm pursuits such that for the people who remain in dairy farming, with their farm units better organized, a satisfactory level of income could be enjoyed, even though the present relative volume of milk in total would continue to be sold and that prices received for the products would be relatively no higher, and probably lower, than those that prevail at the present time.

Part of the reason why the dairy problem exists is that so many of the commercial dairy farmers are willing to work long tedious hours at substantially lower returns than their city cousins or their farm cousins in other farm enterprises. In many cases they are able to continue only because they can get services of family help for "free." Why do they continue, while at the same time complaining about what the city cousin gets without an investment of any kind? Dairymen will give several reasons. Many say that they do not know how to do anything else. They consider themselves tied to the farm financially and do not want to break ties with the community. Memories of joblessness in cities also weigh heavily in their minds. Meanwhile, the returns of nonfarm workers are gradually forging ahead of what many dairymen are able to realize.

III

To solve a problem, causes and not just symptoms must be dealt with. In view of the nature and causes of the dairy problem as set out above, it seems that the only really basic, acceptable solution lies in a 3-front at-

tack: (1) recombining dairy farm resources so as to achieve greater labor productivity, while simultaneously (2) taking positive action to induce more people to transfer from dairy farming to nonfarm pursuits (or to other types of farming), and (3) continuing to soundly enlighten consumers as to the value and importance of milk in the diet. In other words, as a permanent policy, it would seem much more in the national interest to deal with the No. 2 reason given above for the dairy problem "low productivity of resources" than to attempt to perpetually conduct programs designed in one way or another to raise the unit value of the product to the almost complete disregard of the second reason. The outlay by government for a period might well be greater than the cost of administering a moderate-sized purchase and diversion operation. However, a large portion of outlays might be in nature of loans and the expenditures would be in the direction of investments in a permanent solution, recognizing that obtaining equilibrium in a growing economy is a continuing process. The individual human beings concerned would realize a larger improvement in their welfare position and the national product would tend to be increased. Left to normal development, essentially the same adjustment tendency would take place, but it would be drawn out over a much longer period, causing prolonged hardships on farmers and their families and unnecessary and uneconomic expenditure of government funds on year-to-year programs.

The proposal has been presented as if it could be applied readily and exclusively to dairying. Thus the simplifying assumption has been made that people would move directly from dairying to nonagricultural pursuits. As a practical matter, it is immaterial whether such a direct move occurred, or whether some dairymen converted to other types of farming and an equivalent number of such other farmers chose to shift to nonfarm occupations. It is recognized, of course, that essentially the same measures would be applicable (and desirable) for most of agriculture. For this proposal, however, it was assumed that other agricultural programs would continue as now in operation.

To achieve the objective of the proposal set forth above, separate but simultaneous action would be needed in two directions. Many of the farmers who would continue to produce milk would need help to plan improved operations and financial help to enable their adoption of improved plans. On the other hand, several different kinds of activities would be needed to aid those folks who decided to shift to nonfarm occupations.

Let us consider first the second phase of the approach. As a practical matter, to help facilitate an orderly movement of additional people from farm to nonfarm occupations, an action-type program would be needed,

requiring aid of state employment service agencies, federal-state agencies to assist establishment of small businesses and action phases of the USDA operations. An initial objective might be to assist enough people who desire to move out of dairying the first few years so as to have no increase in milk production until equilibrium were reestablished at present support prices.

Major activities in the successful conduct of this phase might include: (1) determining the qualifications of those people who would decide on nonfarm employment, (2) location of opportunities in cities or towns for employees of those talents, (3) probably provision of vocational training, (4) help in choosing opportunities for which the people are best fitted, (5) possibly some help in disposing of their agricultural assets, and (6) possibly some help in moving to the town or city, if such a move would be necessary.

It does not seem unreasonable to expect that enough dairymen would accept opportunities in towns or cities to make this proposal effective. Some reasons for this, in addition to the fact that the rates of pay are higher, are that people who have the temperament to do an acceptable job of handling milk cows must display many of the traits that would qualify them for responsible jobs in various nonfarm lines of employment. On the other hand, many more presumably would be anxious to take an opportunity that would relieve them of the confining and exacting requirements that are typical of a dairy farm. This factor alone should tend to hold down the rate of entry into dairying as the years go by. It may well be that in the not too distant future, work on dairy farms will command a substantial premium over many other lines of work rather than a penalty as now prevails.

Many of the people who chose to continue dairy farming would require services that in general would be a blend between the operations of the Extension Service, farm unit basis of operation, and Farmers' Home Administration in extending supervisory credit. Specific steps in the conduct of this phase of the operation might include: assembling from colleges, USDA, commercial firms and more advanced farmers, information as to the most efficient scale and methods of dairy farming, considering resources available in each area of the country. This information would be disseminated widely and may well play an integral part in planning those operations where the government became involved in the financial phase of the arrangement. More than likely most of the adjustments would involve (1) larger acreages, (2) increased productive potential of milk cows, (3) improved feeding programs as well as (4) recombining and reorganzing resources in general to permit a higher labor productivity for those people who remained in dairy farming.

While the above two approaches to achieve increased productivity for the people remaining in dairying are pursued, it also would be important (1) to attempt to bring about adjustments in marketing, so as to minimize marketing costs (this could well include application of existing knowledge to permit a freer flow of milk among regions of the country and thereby possibly reducing milk output in some high-cost areas), and (2) to continue educational programs to enlighten consumers as to the value and importance of milk in the diet.

While measures are conducted along the lines indicated to achieve a solution to what appears as a chronic dairy problem, it probably would be necessary for a time at least to take interim steps to facilitate an orderly transition from the existing surplus position. These measures might well be similar to those used in recent years, and might still be used to protect dairy prices from definitely temporary jolts originating from sudden weather-induced increases in supply or reductions in demand.

IV

Until a program is adopted to deal with basic causes of the dairy problem, we presumably will continue to be concerned with relative merits of different methods for achieving a certain price level. Many of these, particularly those of production control variety, may actually perpetuate uneconomic uses of resources. Some considerations governing choice of method include: effects on price levels, on production, on consumption, on marketing patterns, cost to government, use of product, and particularly level of stocks that government may accumulate.

The type and number of these programs that might be used would depend upon the severity of the surplus situation. As long as the surplus did not exceed 5 to 7 billion pounds of milk equivalent, a purchase and diversion method probably would be adequate. A surplus moderately larger than this might well require a purchase program in combination with a program of compensatory payments. The size of such a program would be limited by the willingness of Congress to grant funds to implement it. In a very large surplus situation, compensatory payments might become so burdensome that these two approaches would have to be combined with some measure to restrict milk production or sales at the farm level.

Several different methods for dealing with some phases of milk production and pricing problems were discussed in House Document No. 57 "A Study of Alternative Methods for Controlling Farm Milk Production and Supporting Prices to Farmers for Milk and Butterfat." This report was developed in the Department of Agriculture pursuant to the Agricultural Act of 1954. This act directed the Secretary of Agriculture to study

various methods of production control and price support applicable to milk and butterfat and their products. A study was developed by a work group in the Department of Agriculture representing each agency having responsibilities in areas concerned, and the report was delivered to the Congress on January 3, 1955. Major proposals discussed in this report are as follows (from the table of contents):

Methods for controlling milk production
- Milk sales quotas
  - Quotas with penalties for excess marketings
  - Quotas with payments for reduction in marketings
  - Quotas with payments for milk within quota
  - Quotas transferable with decreasing payments
  - Quotas with price insurance
  - Quotas enforced only by legal action
- Cow-number limitations
- Disease control and eradication
- Feed-grain restrictions
  - Feed-grain storage
  - Feed-grain tax
  - Feed-grain rationing

Methods of supporting returns to farmers for milk and butterfat
- Dairy products purchase method
- Loans on dairy products
- Direct payments to producers
- Payments to processors and dealers
- Payments on increased uses of dairy products
- Bargain sale plan
  - Programs financed and operated by the dairy industry
- Marketing orders

Measures to increase consumption of milk and dairy products
- Nutrition research and education
- Merchandising and sales promotion
  - Milk vending machines
  - Advertising and promotion by the dairy industry
- Product development
- Distribution programs
  - Direct distribution programs
    - National School Lunch Program
    - Special school milk program
    - A family milk program
  - A 2-price plan for encouragement of greater fluid milk consumption
  - Plentiful foods program
  - Food stamp and food allotment programs

Summary

The existence of the present surplus of dairy products at the "politically determined" level of price is only a minor aspect of the dairy problem. Of greater importance is the comparatively low level of returns to dairy

farm operators and their families for their labor and management in the production of milk. These returns are low because of low unit value of products sold, or low productivity of labor in production of milk. It is submitted that the more promising avenue of approach to raising these returns lies in increasing productivity of people engaged in dairying. This would require a 3-phase attack: (1) recombining dairy farm resources to achieve a greater labor productivity, while simultaneously (2) taking positive action to induce some people to transfer from dairy farming to other pursuits, perhaps mainly nonfarm, and (3) continuing to enlighten consumers as to the value and importance of milk in their diets, with government help to assure some segments of population sufficient milk products—such as school lunches and gifts to people in some institutions.

Outlays by the government to achieve the objective of this program might be partly in form of loans and would be in the nature of an investment in a permanent solution to the dairy problem, recognizing that achieving equilibrium in a growing economy is a continuing process. The alternative is recurring expenditures, on one of several other types of programs on the tenuous assumption that population will someday increase faster than milk production and thereby increase the unit value of milk sufficiently to raise dairy farmers' incomes to an "appropriate" level. Raising prices even of the largest magnitudes that seem in reason, does not offer the opportunities to increase labor incomes that increasing productivity appears to hold. In any case, a lasting end to the dairy surplus position is not in sight. In the next several years, with feed production on an uptrend, and with many improvements in methods of dairying, milk production may very well increase relative to the population, unless positive steps are taken to induce a smaller rate of increase in milk output.

ECONOMIC PROBLEMS ASSOCIATED WITH MILK MARKETING ORDERS

E. W. GAUMNITZ
National Cheese Institute, Inc.

THESE comments with reference to economic problems associated with milk marketing orders are based, to a considerable degree, upon information developed in connection with the work of a committee appointed by the Secretary of Agriculture over two years ago to review milk marketing orders. Formal report of that committee was transmitted to the Secretary of Agriculture in October 1954 and copies are presumably available from the U. S. Department of Agriculture. When the general question of a statement was discussed it was suggested that there be presented a review of the committee report. Presumably, however, this group is interested in the problems involved rather than the actions of the committee. It is, therefore, proposed to review very briefly the highlights of the committee report and then to attempt to point out some of the problems associated with milk marketing orders, based to some degree but not entirely on the discussions of the committee and on communications from others regarding its work.

During the past few years dairy product price-support and milk-marketing orders have been receiving additional attention in the press, in the Congress, in industry, as well as among those having administrative responsibility for governmental programs. Primarily, attention was directed to the supplies being accumulated by the federal government under price support programs for milk and butterfat which were made mandatory pursuant to the provisions of the Agricultural Act of 1949, as amended—the act setting forth flexible supports for certain agricultural products. At the end of the 1952-53 marketing year—March 31, 1953—the government held 120 million pounds of butter, 75 million pounds of cheese and 170 million pounds of nonfat dry milk solids. On March 31, 1954, government stocks of butter were 364 million pounds, and of cheese 483 million pounds.

The Secretary of Agriculture invited some 100 members of the dairy industry to meet in Washington on April 2 and 3, 1953 for the purpose of assisting in developing a new program that would reduce price support purchases and move acquired stocks. In approaching the question the dairy industry representatives were divided into six subcommittees. The subcommittees for production, disposition of fluid milk, manufactured dairy products, and retail stores and restaurants, recommended that the milk marketing order program be reviewed. Such recommendations were retained by a task group assembled to consolidate the recommendations

of the larger group. As a result another committee composed of fifteen was appointed for this order study purpose. More specifically, among other things, the group was to review the use of so-called economic factors in pricing Class I milk, soundness of the price relationships among milk for bottling, cream and manufacturing milk, the restrictions within the orders on the movements of milk among markets, and the methods of pricing manufacturing or surplus milk.

It seems fair to state that, with the downswing in farm prices of milk and butterfat, as governmental dairy-product price-support purchases and inventories have increased, criticism of federal and state milk control orders has also increased. Such orders had their beginning in the depression period of the early thirties. The number and scope of orders has increased, particularly in the last few years, until almost all large fluid milk markets and many others are operating under them. The feeling is quite general among those interested in manufactured dairy products particularly, that under such orders the prices of milk for fluid use have been established at levels arbitrarily high with reference to prices of milk used for nonfluid purposes. As a result many feel that such orders have unduly stimulated milk production in the fluid areas, have served to reduce fluid milk consumption by contributing to the maintenance of artificially high retail prices, and, as a consequence, have contributed materially to the surplus dairy products situation.

The Federal Order Study Committee concerned itself primarily with pricing policies, provisions relating to the movement of milk and milk products in order markets, and the administration of the order program. Without going into detail the general conclusions of the committee with reference to price policies, as included in the report are set forth as follows:

1. The primary purpose of federal milk marketing orders is to maintain an adequate supply of milk, and to achieve orderly marketing. This is being accomplished in fluid milk markets with federal orders.
2. During the postwar years the margin of Class I prices over manufacturing prices has been wider on a dollars and cents basis than in former years. This has been true in all types of fluid milk markets including federally regulated, state regulated and nonregulated markets.
3. This situation resulted primarily from the wartime shortages and the need to obtain additional supplies for many fluid markets. The committee has developed no adequate explanation for the continuance of the wide margins between prices of fluid milk relative to manufacturing milk prices in recent years.
4. In recent years these shortages have been generally eliminated, and have been replaced in many instances by oversupply in relation to fluid needs.
5. Formula pricing and particularly supply-demand price adjustments have served to reduce Class I prices as supplies became more ample, but have

not, in most markets, narrowed the spread between fluid milk prices and manufacturing milk prices.

6. Lags occur in adjustments of production and consumption to price changes.
7. There is little evidence that federal orders have increased production more than has occurred in other markets or areas of the country. Due to shifting of plants and producers, the receipts of milk at plants subject to a federal order do not necessarily reflect changes in area production. In the Northeast, which is the only area for which fairly comprehensive figures are available, total milk production in relation to Class I utilization has not been as high as it was in the early forties.
8. Two general types of Class I formulas are now in use: One is the type which uses manufacturing milk prices as the mover and the other uses various indices of economic factors. Each has advantages depending on local market conditions. Whichever is used, it is essential to have an adequate supply demand adjustment. The ultimate test of the soundness of any pricing program for fluid milk is the maintenance of an adequate supply in relation to the fluid market requirements.

The problem of the movement of milk and milk products into markets was one of the most controversial. The report sets forth two statements on the subject, each of which is complete in itself.

One statement sets forth the analysis supporting the inclusion of present federal order provisions regarding compensatory payments and plant classification, and the other sets forth the analysis against the use of such provisions in orders. Regardless of the disagreement among the members of the committee on the subject of the use of compensatory payments and plant classification provisions, the committee was in substantial agreement on certain general comments with reference to such provisions. The report summarizes these as follows:

1. No evidence was developed to indicate that the use of compensatory payments and plant classification provisions has been abused up to this time. However, the data before the committee with reference to available supplies of milk necessarily related to so-called pool milk, rather than milk which was received from nonpool plants, or which was available, but not shipped to the market, and was therefore not ascertainable.
2. Some means is essential to identify the participants in a market pool, or define the scope of regulation.
3. It is conceivable that compensatory payments and plant classification provisions might be so used to limit the supply of milk fully priced and pooled in a market that the volume of such milk would not serve as a reliable indicator for sound pricing. Under such conditions so-called automatic supply-demand adjustment provisions would become less effective. The problem is primarily one of sound administration, in the public interest.
4. The appropriate relation between the supply-demand adjustment provisions, and the compensatory payment and plant classification provisions will vary according to local market conditions.

5. Care should continue to be exercised in designing such provisions in each individual market order so that compensatory payments and plant classification provisions do not obscure, or render ineffective, the supply-demand adjustment provisions.

It is apparent that the question of relative prices of milk used for fluid consumption received considerable attention by the committee. Factually, using the tests of percentage of milk receipts used for fluid use and the relationship between fluid milk prices and condensary prices, it was found that fluid milk prices seemed relatively higher than was necessary and that the differential of fluid prices over condensary prices was not correlated with the ratio of fluid usage to total receipts.

In this connection it is of interest that the committee accepted as the ultimate test of soundness of a pricing program for fluid milk the maintenance of an adequate supply in relation to fluid requirements. Probably, there should be added as a matter of clarity "and not more than an adequate supply." With this general objective I believe there is agreement among students.

It seems that the pricing standards as set forth in the Federal Marketing Agreement Act of 1937 expresses this objective very well although the words "price of feeds," and "available supplies of feeds," and "in the public interest" leave some room for interpretation.

State standards generally are probably not as concise or, at least, the interpretation is different and variable. As reported in the 1954 proceedings of the International Association of Milk Control Agencies, at least three representatives of state control agencies (Florida, Oregon and New York, p. 37) seemed to take the position that Class I prices, and possibly average or blended prices, should be related directly to changes in producer costs. It was also of interest that fluid prices in markets under state control are, on the basis of relative prices, even more arbitrary than those under federal regulations.

As was noted in the statement of the study committee, "market receipts" in the federal order markets do not include milk that might well have been shipped to the market, if compensatory payments were eliminated and pool plant provisions were defined differently.

O. M. Reed, in a statement before the Dairy Subcommittee of the House Committee on Agriculture (U. S. Congress) on June 1, 1955, and in a supplementary statement submitted to the same subcommittee under date of July 5, 1955 based on data for specified federal order markets, concluded that reported milk market receipts were understated in that "unpriced" milk was not included.

In the review by Mr. Reed which covered various periods from 1940 to 1954 depending upon the continuity of the data within the markets,

all nine markets showed an unmistakable trend for receipts from producers, as defined, to increase faster than Class I sales.

The common provisions regarding classification of pool plants and the use of compensatory payments under federal regulations were the subject of the greatest difference of opinion within the order committee. In general, the use of plant classification and compensatory payments is based on the conclusion that market orders with market-wide pooling will not work without provisions for compensatory payments and plant classification rules. Those holding the contrary view believe that such devices are unnecessary and would lead to additional arbitrary pricing if specific criteria should be provided. As a side view it would seem that if compensatory payments are necessary to "protect" the classified pricing scheme under the market-wide pools, then such payments should be just as necessary in individual handler pools.

In considering some of the problems associated with milk marketing orders—excluding from the statement the problems associated with so-called "resale" prices— it is assumed that the primary objective of marketing orders for fluid milk is that of so pricing as to bring forth the necessary supply of milk under conditions of free entry to the market, except for restrictions resulting from applicable sanitation standards, transportation charges and minimum prices to producers.

The pricing of milk by classes apparently needs further review. If the price criteria commonly used in connection with Class I prices are correct, certainly more complete data should be developed as to available fluid supplies.

Pricing criteria for milk used for non-fluid purposes under orders probably need much more study than they have received. It is not clear whether such milk is over or under priced. Over or under pricing certainly is a matter of considerable concern among different types of operators. Should the same general criteria used for pricing Class I milk be applied to non-fluid milk? One of the difficulties of so doing is that the two are handled by the same operators.

There seems to be a considerable difference of opinion among people with reference to the effects on total milk supplies of market-wide and individual-handler pools. For the most part, state orders do not provide for market-wide pools, although a number of people believe that orders cannot be operated successfully without market-wide pools.

Also the basis for and effects of plant classification and compensatory payment provisions certainly are not clear to most people. It should be possible to analyze such provisions so that the basis for and effects of such provisions would be perfectly clear.

Marketing areas are being expanded, yet the basis for such expansion

is not clear. Are areas to follow distribution? If so, it appears that sooner or later all milk sold by producers will need to be priced. In this respect the situation seems to be becoming more complicated all the time. Previously, a handler distributed milk only within a limited area, as a number of studies have shown. However, this is no longer the case. As the area covered by a distributor widens, question is raised as to the prices to be paid producers for milk used outside the defined marketing area. When the area is expanded or new orders issued, new handlers are brought under regulation. The final result would seem to be that all producer milk in the distribution area would be priced.

If the conclusions of the Federal Order Study Committee are correct it appears that fluid milk prices (and average prices) under marketing orders are abnormally high, or relatively high, with no indication of any correction. Supplies in the fluid markets seem higher than necessary and there is some indication that supplies are understated. Under such conditions it seems logical that the pressure further to expand areas from which milk supplies are drawn will be continued. Temporarily, such provisions as plant classification and compensatory payments may be used to furnish a barrier to such expansion, at least from "outside" milk, but if the incentive is sufficient new handlers may be expected to appear using outside milk.

A continuation of prices above those sufficient to bring forth necessary supplies, coupled with expansion of marketing areas, places pool handlers in a position to outpay nonpool handlers and to expand operations. This will, of course, be influenced by surplus prices, surplus returns and transportation differentials. Over a period this would mean in the end the subsidization of nonfluid operations from fluid operation incomes. If such is the tendency, operators of manufactured dairy product plants will probably be forced to enter the fluid business, or manufacturing milk operations will become subsidies of fluid operations.

DISCUSSION: THE IMPACT OF TECHNOLOGICAL CHANGES ON MILK PRODUCTION

M. S. PARSONS
Production Economics Research Branch, Agricultural Research Service

The subject assigned to Dr. Wheeler could be approached from several different viewpoints. He has chosen—wisely I believe—to confine his analysis largely to the impacts of technology on individual producers. In doing this he has made a comprehensive summary of the technological changes of the past and their impact on various aspects of milk production. He has accomplished this in his own characteristic way, combining a thorough grasp of the pertinent economic principles with a very practical understanding of dairy farming. Among

other things he has made a good analysis of why farmers don't always make maximum use of available technology or don't always "do as they should." He points out the importance of practices that have increased the yields of feed crops on dairy farms, and he makes the significant observation that heavy investments in power and equipment have sometimes paid out only because they permitted the harvesting of better quality feed.

In reviewing Wheeler's paper I find no major points of disagreement. I do want to raise a question regarding his statement on the rate of grain feeding. He points out that technology has made it possible to provide cows with higher quality forage, and goes on to say that "under these circumstances the economy of heavy grain feeding is doubtful." This statement does not say that any large number of dairy farmers are feeding too much grain but it may carry that implication. In any event a feeling appears to be growing, even among some economists, that the feeding of grain is being overdone. A few farmers may have been feeding their dairy cows too much grain in an economic sense, but I suspect that for each farmer in this group there are at least 100 who have been feeding too little.

In this connection many people have deplored the fact that the last 10 to 15 years have seen an upward trend in the rate of grain feeding per cow despite a fairly intensive program of forage improvement. Actually it seems to me that this is not a cause for alarm; rather it shows that farmers are doing a better job of feeding. Apparently they believed that under the prevailing economic situation and with the kind of forage available—even though it is better than in the past—it was profitable to increase the rate of grain feeding. Perhaps they have done this without much thought of forage as a substitute for grain. We need to keep in mind that although the rate of grain feeding per cow has increased, the rate per pound of milk produced has been fairly constant over the last 10 to 15 years. Furthermore, we need to keep in mind that high-quality roughage may be quite expensive—perhaps even more costly than grain under some farm situations.

I wish, as I'm sure Dr. Wheeler does, that he could have gone further in analyzing the impact of technology on milk production in the future, including the effects on different groups of producers and different areas. He recognizes the problem and discusses it in terms of the forces operating and the economic considerations involved. But he chooses not to go very far in estimating the future. He is aware of the difficulties in making such estimates and perhaps he recalls some of the slips that we have made in the past.

One point mentioned in the paper deserves greater emphasis. This is the fact that technology has had different effects on different groups of farmers. Some have had the resources and the inclination to adopt new technology at a fairly rapid pace. Generally speaking, the result has been more milk produced per cow, per acre, per worker, and per farm. No doubt net income has also improved, at least over what it otherwise would have been. At the other extreme are those farmers who lack the resources or the inclination to make anything like full use of modern technology. This group has not kept pace with technological development and many of the operators have shifted to off-farm employment or to less demanding farming enterprises. Much farmland has been abandoned in the process.

So it appears to me that in the future, as in the past, technology will continue to have differential effects that will operate to bring about opposing trends among different groups of dairymen, and perhaps among different dairy

areas. The farmers who adopt new methods will probably continue to expand production. Those who cannot or will not make good use of technological improvements are likely to decrease dairying, in some instances to zero, and some further abandonment of land may occur. The net result probably will be a continuing upward trend in total production of milk, although perhaps with some plateaus for a few years such as we appear to be experiencing currently.

DISCUSSION: THE DAIRY PROBLEM AND A SUGGESTED SOLUTION

E. FRED KOLLER
University of Minnesota

Mr. Kriesel has given us an excellent statement of the nature and magnitude of the dairy problem and has outlined a basic solution. I find myself in general agreement with his views, so my remarks will be largely supplementary or by way of emphasis.

In working toward a solution of the dairy problem the major emphasis should be on the more basic long-term aspects of the job of bringing about a more efficient organization of the industry, and on improving consumption. I would interpret efficient organization of the industry somewhat more broadly than Mr. Kriesel has in this paper to include more efficient organization and methods of distribution as well as more efficient organization of dairy farm production.

This may sound like a prosaic answer to the dairy problem as compared with some direct action programs such as purchase plans, direct payment plans, milk production control and other programs that may be suggested. However, some types of action programs present serious difficulties, as Mr. Kriesel has pointed out, and they may impede the fundamental adjustment that needs to be made. Action programs have a place in the solution of the dairy problem but they need to be carefully tailored to the situation and their role should be limited.

In solving the dairy problem high priority should be given to a program of increasing production efficiency, which will help fit dairy farming into the framework of a more efficient agriculture. Much has been said along these lines but much remains to be done. It is true that many of the cost-reducing techniques, such as enlarging herds and bringing in higher producing cows, result in increased output. However, these methods need to be used along with others, such as work simplification, more labor-saving equipment, and substitution of more and better pasture and forage for grain feeding. Currently it would be desirable to put more emphasis on the latter group of methods in our education programs.

Mr. Kriesel has pointed out that the low productivity of resources—particularly labor—is a major factor in the dairy problem. One way of solving this is to reduce the supply of the factor you desire to benefit, that is, dairy farm operators. Some dairymen may well consider dropping dairying and shifting to other lines of farm production. Others may be encouraged and assisted in moving to better paying non-farm jobs, thus benefiting those who remain. This type of adjustment has been occurring in agriculture for a long time but it may be accelerated by appropriate action.

Another aspect of a basic solution is to increase the efficiency and reduce the cost of dairy distribution. Mr. Kriesel has not developed this aspect of a solu-

tion in this paper. It is a significant approach and I believe it offers much promise in helping us out of our difficulties. There has been much good work along these lines in recent years. Many improved marketing methods and devices have been developed and applied.

Even more significant improvements in market distribution remain to be made. For instance, we need to take another look at rising labor costs particularly in fluid milk distribution. In most markets these are 60 to 85 per cent of total delivery costs. These costs continue to rise at a relatively rapid rate as a result of inefficient practices, feather-bedding, exorbitant requests of some unions, and other reasons. Recent milk driver wage settlements in the Twin Cities will bring the annual payments to some wholesale drivers into substantial five digit figures. We may ask if dairy labor groups do not have a responsibility for getting milk through to consumers at reasonable rates?

It has appeared to me for some time that a large proportion of the gain that has been effected by more efficient marketing has been absorbed by certain groups of dairy labor. In many cases relatively little of the gain is reflected back to the producers, or forward to consumers. This problem warrants study to determine how the gains of improved marketing are shared by the various participating groups.

We need to encourage the development of new products, new devices and new techniques, that result in greater efficiency in distribution. For instance, it has been demonstrated that fresh concentrated milk can be sold at a large saving over regular milk. Impediments in the marketing system, including some put up by labor groups and some by local dairy producers protected by market regulations, have for the time being halted progress in the sales of this promising product in most markets.

Improved pricing, particularly of fluid milk, can be helpful in a long-term basic solution of the dairy problem. Lower consumer prices, particularly in markets now having relatively high prices, would encourage use of more milk. Wider use of store differentials and larger quantity discounts for home delivered milk should aid the larger use of milk. As Mr. Kriesel has pointed out, the income elasticity for the services that go with milk is large

Unduly restrictive sanitary regulations and other market controls hinder or prevent the movement of outside milk into many cities. The freer movement of milk among areas would encourage increased use of milk by consumers in some markets, and it would probably reduce milk output in high cost areas. Certainly we should not "protect" the consumers health to the point where we price milk out of the reach of many consumers.

Another of the basic programs that should be carried forward is continued educational work to enlighten consumers as to the importance of milk in the diet. Many different programs are being used and are contributing toward enlarged consumption of dairy products. Distribution programs to increase consumption by school children, by welfare institutions, and by low income individuals, warrant further encouragement.

Progress toward a solution of our dairy problem via a program of basic adjustments in the direction of greater efficiency may be slow. Some type of direct action program probably will be needed in the transition period while these adjustments are being made. In this connection I like Mr. Kriesel's very sensible suggestion that the type of program might vary with the severity of the surplus situation. That is, in case of minor excesses use a purchase method and in the most severe situation use a system of production controls. Direct action

program should be kept to a minimum. They should be designed to avoid interfering with or discouraging the adoption of programs of adjustments and improved efficiency.

Mr. Kriesel has suggested a program of sound medication. Production control will be a bitter pill if it needs to be used in any of its forms. Extremely difficult administrative problems are involved. Probably as difficult as any is how these plans may be kept flexible enough to keep up with changes in farming. Farmers need to be free to adopt cost-reducing techniques. I am fearful also that the politics of production control will be such that dairy producers with 6 or 8 cows or less will be exempted. This will put a double burden of restriction on the larger more efficient producers.

There is still another aspect to a solution of the dairy problem to which Mr. Kriesel briefly referred, but which he did not develop. Dairy farming is part of an interrelated agriculture. Whether the dairy problem can be solved readily, or only with great difficulty, depends on actions taken in solving surplus problems in other sectors of the agricultural economy. As acres are diverted from wheat, corn and other controlled crops they will be used to produce feed grains, pasture, and forage crops. A good share of this output is likely to turn up in added dairy output. Thus, solution of the dairy problem depends in part on realistic solution of the diverted acres problem arising under the crop control programs.

Another point in the solution of the dairy problem that needs to be considered is the effect of our rapid population growth. The need for 1½ to 2 billion additional pounds of milk a year to take care of our growing population will help materially in bringing about a balance between supply and demand. We should recognize, however, that improving dairy technology and the shifting of resources from other lines of agriculture will to some degree modify this effect.

DISCUSSION: ECONOMIC PROBLEMS ASSOCIATED WITH MILK MARKETING ORDERS

LELAND SPENCER
Cornell University

Dr. Gaumnitz has done a most commendable job in summarizing the findings of the Federal Milk Order Study Committee and in outlining some of the main problems that were considered by that committee. There is nothing in his paper with which I can take direct issue. My task, therefore, is to discuss somewhat more extensively, or from a different viewpoint, a few of the problems that he has necessarily covered rather briefly.

Pricing Standards and Policies

Dr. Gaumnitz says the committee accepted, as the ultimate test of soundness of a pricing program for fluid milk, the maintenance of an adequate supply in relation to fluid requirements, meaning neither *less* nor *more* than an adequate supply under conditions of free entry to markets. He believes there is general agreement among students with this general objective. It probably is true that most students of milk marketing problems do accept this doctrine, but it is not generally accepted among producers of market milk, and their spokesmen.

Market milk producers feel that the Secretary of Agriculture has shown

much more concern for balancing supply and demand for fluid milk than Congress has indicated for balancing supply and demand for other farm commodities. Producer spokesmen insist that cost of production should receive major emphasis in determining minimum prices for fluid milk and that their incomes should be comparable in purchasing power to those of other groups of people. They contend that these objectives are in accord with at least one of the objectives prescribed by the Agricultural Marketing Agreement Act—namely, that the prices established shall be "in the public interest."

It is Dr. Gaumnitz' view that the pricing standards of state milk control laws are not as concise, or that they are not as uniformly interpreted, as the standards of the federal Agricultural Marketing Agreement Act. Neither the federal act nor the state milk control laws deserve a high rating with regard to clarity of indicated pricing policies or standards. Some state laws give as definite and as logical directives as the federal law, but it is true that the interpretations vary from state to state depending upon the knowledge and leanings of the milk control officials and upon the pressures exerted by producers' organizations and other groups. Generally speaking, the state officials feel little or no responsibility for the effect of their policies upon the national surpluses of milk products, and they have relatively little concern for the criticism of high fluid milk prices which emanates from the dairy manufacturing areas of the Midwest. Consequently, they have given less emphasis than those in charge of the federal milk orders to the doctrine of adequate but not more than adequate supply. It seems that the only practical way to deal with this problem is through more economic research and education.

A recent report on a regional study of milk control programs of the northeastern states has this to say about pricing standards and objectives:

> The state milk control laws specify certain factors and conditions that the responsible officials must consider in fixing the minimum prices to be paid by dealers. Among these are cost of production, reasonable returns to producers, adequate supplies of pure and wholesome milk, purchasing power of consumers, and a proper balance between supply and demand. The standards are indefinite and the weights to be given to the several factors are not specified. It would be a mistake to limit the discretion of milk control officials too narrowly, but the authors believe the basic policies and objectives should be more clearly stated in the laws. If, for example, it is intended that production costs be considered as a pricing factor only with respect to that portion of the supply required for fluid use, together with a necessary surplus, that policy should be clearly established by law. The laws might well require also that the milk control agencies make findings as to the desirable relationship between total supply and fluid sales in the various markets or milk control areas and fix prices so as to approach that objective.
>
> The milk control programs have been looked upon quite generally as a means of improving the economic position of dairy farmers. In fixing the minimum prices to be paid by dealers, much more emphasis has been given to production costs and related factors than to the demand side of the market, or to the balancing of milk supplies and fluid sales. In many instances, the prices fixed have stimulated production beyond market needs.
>
> Consumers have shown surprisingly little interest in the milk control programs and, as a rule, have been poorly represented at public hearings on proposed orders and amendments. This accounts in part for the inadequate attention given to the demand side of the market by milk control officials. Insufficient knowledge of price-production and price-consumption relationships has been one cause of the failure to fix prices so as to keep the supply of approved milk in closer adjustment to fluid sales. *There is much need for further research to make possible more reliable estimates of the responses producers and consumers will make to given changes in price.* Meanwhile,

the presently available knowledge of these matters, though obviously inadequate, could be used more fully than it has been in the past.[1]

Milk marketing economists and price analysts are in part responsible for the failure of milk control officials to adhere, in their decisions on pricing of fluid milk, to the objective of maintaining a close relationship between market milk supplies and fluid sales. They have not yet supplied sufficiently clear and convincing evidence on price-production and price-consumption relationships in city milksheds for the guidance of milk control officials. The inadequacy of present knowledge of these matters is strikingly illustrated by this fact: the belief that lower prices stimulate increased production, appears to have rather wide acceptance not only among producers but also among milk industry leaders and milk control officials. It is not surprising that prices fixed on the basis of such beliefs have not kept market milk supplies in good balance with fluid sales.

The Principle of Adequate Supply

Dr. Gaumnitz has pointed out that it is difficult to apply logically the principle of adequate supply in pricing milk for a market whose supplies are arbitrarily restricted. Had the length of his paper been less restricted, he might have discussed the related problem of determining what *is* an adequate supply. Considerable attention is given to this matter in the recent report of the U. S. Department of Agriculture on Regulations Affecting the Movement and Merchandising of Milk.[2] This report states that the measurement of adequacy involves several subsidiary questions, namely a definition of purity and wholesomeness, the uses to which the supply should be related, the interval of time over which a balance must be assured, and the extent of reliance upon "local" as contrasted with "outside" sources.

Day-to-day fluctuations in production and in fluid sales during the month of lowest production are said to require an operating reserve equivalent to 15 to 20 per cent of the sales. In addition, a seasonal reserve is necessary because of dissimilar seasonal patterns of milk production and fluid sales, unless outside sources are relied upon to supplement local production during much of the year. And finally, allowance must be made for year-to-year fluctuations in levels of milk production and fluid sales.

"During the past 20 years, or even the past 10," says the report, "there have been periods when fluid milk markets generally had supplies far in excess of Class I sales plus operating and seasonal reserves, alternating with other periods when these markets, in the low-production months, were in a scramble to find 'emergency' supplies."

There are strong differences of opinion and of policies regarding the extent to which milk from outside sources should be relied upon to supplement local production in meeting the needs of a market for fluid milk and fluid cream. Obviously, it is no simple matter to determine what constitutes an adequate supply of milk for fluid use, and the determinations cannot be made on a uniform basis for all markets. There is need for more studies to analyze and evaluate objectively the alternative methods of fulfilling market requirements for fluid milk and cream under different conditions.

[1] *Milk Control Programs of the Northeastern States*, Part I, Bul. 908, Cornell University Agricultural Experiment Station, 1954, pp. 121, 122. Underlining supplied by the writer.

[2] *Marketing Research Report No. 98*, Agricultural Marketing Service, U. S. Department of Agriculture, June 1955, pp. 43-46.

Pooling Plans

Another issue that is mentioned very briefly in Dr. Gaumnitz' paper pertains to the type of pooling that is provided for by federal and state milk orders. He and his committee were concerned with the effects of different types of pools upon total milk supplies. It seems there can be no doubt that marketwide pools tend to *attract* larger supplies of milk than individual dealer pools. The report on Regulations Affecting the Movement and Merchandising of Milk puts the matter this way: ". . . individual dealer pools tend to restrict 'regular' supplies, since the dealers have a strong incentive to limit their purchases. Each dealer tends to keep his purchases to a minimum, so his sales of Class I milk will be the largest possible proportion of his total sales, and his price to producers correspondingly high.

"Marketwide pools, on the other hand, tend to attract surpluses. . . . It has been the experience, especially in the Northeast, that markets with marketwide pools become the reservoir from which markets with dealer pools draw supplies in the season of low production."

It is also true that marketwide pools encourage bringing more farms and plants under city inspection, thus increasing the total quantity of milk readily available for fluid use. Marketwide pooling may stimulate slightly greater total production of milk in the areas to which it applies since it gives producers greater assurance of a ready and continuous market for all the milk they care to deliver.

Dr. Gaumnitz' comment that most state orders do not provide for marketwide pools, although many believe orders cannot be operated successfully without them, calls for some discussion. The Northeast regional report on milk control programs (pp. 50-51) has this to say about the need for marketwide pooling:

> Under some conditions, marketwide equalization appears to be necessary for the success of a milk control program. This is true where there is a relatively large amount of surplus milk that is unevenly distributed among handlers. Ordinarily surplus milk is more of a problem in large markets than in smaller ones. In large markets relatively greater surpluses are necessary to take care of fluctuations in the supply and demand for milk. Secondly, in the large markets there tends to be more specialization in the manufacture of milk not needed for fluid uses. This specialization develops among individual plants and also among handlers. For example, in the New York and Boston milksheds there are handlers who supply fluid milk for their respective markets only during periods of temporary shortage. At other times, they use practically all of their milk for manufacturing purposes. Without marketwide equalization the producers who deliver milk to such handlers would receive low prices, while producers delivering to handlers with mainly fluid outlets would receive much higher prices. Because of natural and institutional barriers, it is difficult for producers receiving lower prices to shift to more satisfactory outlets.
>
> The inequity in returns to producers under such circumstances leads to unrest and instability in the market. If the differences in return become very great, it will become difficult to enforce the legal minimum prices. . . . Experience in New York during the 1930's indicates that producers and dealers will find many ways of evading the law, if strong incentives to do so are allowed to exist.

Many orders appear to be operating successfully without marketwide pools because the surpluses normally associated with those markets have been attracted to marketwide pools that have been established in neighboring areas. Pooling operations under the Boston and New York orders contributed greatly to the successful, or partially successful, administration of nonpool orders for Rhode Island, Connecticut, Philadelphia, and many secondary markets of New England

and Pennsylvania. This relationship is stated with commendable clarity on pages 48 and 49 of the report on Regulations Affecting the Movement and Merchandising of Milk.

Limiting Supplies in Marketwide Pools

The principle of free entry to markets appears to be somewhat incompatible with marketwide pooling. It is evident that if marketwide pools are to function successfully, they must be protected from overloading. This problem has become very serious in New York. About two years ago, a special committee studied this and other problems relating to the New York order and made a number of recommendations.[3] Prominent among these recommendations were proposals that more strict requirements be established for plants entering and remaining in the pool. So far these proposals have not been acted upon.

The New York Milkshed Committee also recommended the adoption of a rather simple type of base-rating plan, the bases to be determined by producers' deliveries in the fall months of each year.

Some thought is now being given to the possible use of a different type of quota plan that would tend to discourage production beyond fluid sales requirements as well as to induce more even production throughout the year. Under this type of plan, the producers for a given market would be assigned quotas based on a percentage of their deliveries during a representative past period so that the total amount of quota milk would approximate the fluid sales. Producers would receive a fluid milk price for quota milk and a surplus milk price for any excess over quota. The opportunity to earn larger quotas in the future might be limited by basing the quotas on average deliveries during specified months of three or more years.

Under such an arrangement a producer who increased his deliveries would get the surplus price rather than a blended price for the additional quantity. Similarly, a producer who chose to reduce his output would sacrifice only the surplus value of the decrease rather than the pool value.[4] If the quotas were determined on the basis of average deliveries during three or more years, the quota plan would serve to protect a marketwide pool from any influx of producers. It would be less arbitrary and discriminatory than other devices for limiting participation in marketwide pools, especially so if provision were made for free exchange of quotas.

Summary

The main points I have tried to bring out in this discussion are:

1. Policies and standards for pricing market milk should be more definitely stated in the Agricultural Marketing Agreement Act and in the state milk control laws.
2. Much fundamental research and a great deal of education are needed concerning the relationship of price and other factors to production and consumption of milk.
3. There is also need for objective analysis and evaluation of alternative methods of supplying fluid milk (and fluid cream) to city markets in adequate quantities at all times.
4. Marketwide pools are essential for orderly marketing in many situations. Such pools must be protected from overloading, through strict requirements for pool participation, by the use of marketing quotas, or perhaps by both of these devices.

[3] *Report of the New York Milkshed Committee,* published by the Market Administrator, New York Metropolitan Milk Marketing Area, 1954.

[4] "Quota Plans to Regulate Milk Supplies," *The Metropolitan Milk Producers' News,* April 1955.

PROVIDING MORE ADEQUATE AGRICULTURAL DATA

Chairman: James E. Crosby, Jr., Division of Agricultural Programs, Extension Service, USDA

MAKING EXISTING LOCAL DATA MORE AVAILABLE AND USEFUL

FRANK V. BECK
Rutgers University

LOCAL data, as discussed and referred to in this paper, mean county, township, or minor civil division data as published by the census and other government agencies. The word "existing," in its title, is defined and used in this sense: already assembled, but not necessarily available in a form suitable for publication.

More Local Data Are Necessary

To answer the question why more local data are necessary, let me quote from the paper presented by Dr. Walter H. Ebling at last year's American Farm Economic Association conference. I quote: "Agricultural data requirements have changed with time. . . . Much of our agricultural work has changed from broad, general, or macrocosmic considerations to the particular or microscosmic in constituent units of the state and nation. In fact, when workers at state and local levels are now asked about their agricultural data requirements, they show clearly that the great frontier of unsupplied needs lies first at county and second at state levels. . . ."[1]

With the permission of Dr. Ebling, I have had reproduced for you a small chart which summarizes very neatly the study he reported on last year. It clearly points out that present demands and new requirements for agricultural data are greatest for county or minor civil divisions.

Extension Needs Local Data

It is my firm conviction that local data requirements will become increasingly important as we embark upon an expanded extension program. Between now and January 1, 1956, an intensive grass roots study of the extension service will be made in 10 percent of all the counties in the United States. The aims of this study are:

1. To take stock of the present situation in the county, taking into account all factors such as resources, population trends, agricultural production, and educational facilities.

[1] See paper by W. H. Ebling and Henry L. Ahlgren, *Journal of Farm Economics*, Vol. 36, No. 5, December 1954, p. 1226.

CHART[2]

[2] Prepared by W. H. Ebling, Agricultural Statistician, Wisconsin Crop Reporting Service, Madison, Wisconsin.

2. To determine the potential of the county as seen by the people, including possibilities for agricultural expansion, changes in production to meet changes in land use and market situations, guiding industrial and housing developments, and providing opportunities for young people to the end that the best type of home and community life may be achieved. . . .[3]

I spoke to our extension supervisor about the study. He remarked, "We will need to use all the facts and figures that we can find at the county and township levels, and I am afraid we haven't got enough of them available in a useful form, either. . . ."

Municipalities Need Local Data

As more rural areas feel the increasing pressure of our growing population, there will be a greater demand for local data to plan for new schools and municipal services. You cannot plan locally with state or national facts and figures—you must have local data. As a matter of fact, I believe the big "rhubarb" in the 84th Congress over the suggested bills for federal aid to education stems from inadequate local and state information about school needs. Federal estimates and projected plans gave rather queer and questionable results when presented at congressional hearings.

Expansion or Contraction?

You may be thinking that certainly local data should be expanded. Anyone can see that, so why belabor the issue? But the facts are quite different. Instead of expansion, there are those who believe in curtailment for economy reasons. For example, there are those who believe only a sample census is necessary every 5th year. Also, the tabulations of data by minor civil divisions are being curtailed to save money. Census officials believe that not enough use is being made of local data to justify them to tabulate and publish them by minor civil divisions.

Results of AFEA Inquiry

To help answer this latter complaint of census officials, your AFEA committee drew up a brief questionnaire and sent it to state agricultural statisticians and a few agricultural economists. Thirty-seven questionnaires were returned. That may sound like a small sample, but remember it is from a select list. The geographic coverage of the United States was very good and the thirty-seven replies do indicate much thought was given to the problem.

There were three questions asked on the AFEA inquiry. In reply to the first question, "What census data on agriculture now shown by

[3] Staff letter dated July 8, 1955 by L. G. Cook, Associate Director of Extension, Rutgers University.

counties would you like to use by minor civil divisions in your state?", five responded "No" or that county data were sufficient for their needs. Thirty-two responded "Yes" and went on to enumerate what particular local data they desired. There was such a wide range of items listed it would be difficult to enumerate them all. In a summary statement, I would conclude that census officials should re-examine their decision to economize by eliminating minor civil divisions from many of their tabulations. I maintain it would be "false" economy based upon the results of this inquiry. And furthermore, if researchers and commercial concerns were polled, the need for more rather than less detail would be the most likely answer.

The second question on the AFEA inquiry was . . . "For which of the items shown in the census do you now have annual county estimates in your state?." Eighteen reported county estimates annually for a few principal crops. Nineteen replies showed a longer list of crops and included also annual estimates for certain important livestock and livestock products. Respondents to this question generally agreed that more county data are needed, but either funds were lacking to publish them or their reliability prevent them from being released for publication. Many replied that they would like to expand this phase of their work because they receive so many urgent requests for local data. One statistician in a small state kept a daily record of his telephone calls over a 60 day period and he found that thirty-six calls requested county information.

The third question on the AFEA inquiry was "What additional annual estimates are needed by counties in your state?." There was a wide range of items requested. The most frequently expressed need was for farm income estimates by counties. Following that came livestock and poultry statistics as related to total numbers, new-born animals, and output of animal products. Still others suggested a wide variety of minor crops. To illustrate, I will quote from the remarks made by four state statisticians: "There are about 30 minor fruit and vegetable crops grown commercially in this state. County estimates are necessary on an annual basis. In addition, production forecasts are needed for several of these crops" . . . (New Jersey) . . . "Annual county estimates of major field, fruit, and vegetable crops and for milk cows and poultry are in much demand. These county estimates need to be precise and not close approximations if they are to be serviceable. It is doubtful that limited mail samples will provide all the basic data needed for preparation of these estimates, as many of the items are grown on only a small proportion of the farms in each county" . . . (New York) . . . "All major field crops, also peaches and apples. County assessor data or other reliable information are not available to prepare

county estimates for crops other than cotton" . . . (New Mexico) . . . "Acreage and production of irrigated crops" . . . (Kansas).

It is apparent from these four selected quotations (and I could quote many more) that the great need for agricultural data is not at the state or national level, but at the local level. I also learned from the study that certain states are doing a much better job of making available and publishing existing local data. In appraising some of the reasons why, I have boiled it down to these five points:

1. The state statistician is the person who must take aggressive leadership; other persons will ask for local data and support the cause, but the statistician must assume the leadership role.

2. The states with cooperative federal and state projects have had more funds and personnel to publish local data.

3. Where there has been a close relationship between the state agricultural college and the state statistician, more uses have been made of these local figures.

4. In states where the local assessors gather data in a systematic and effective manner, there is greater confidence and reliability in the local data.

5. Certain states have made better use of production and output information furnished by commercial concerns such as gins, elevators, canneries, creameries, condensories, cheese factories, and cooperative auction markets, etc.

More Data Available Than Published

Although it is granted here that existing local data may be scanty and weak in many states, I raise this important question. . . . "Are we making the most of existing local data available and useful to our constituents?" My answer is "I think not." In other words, some state statisticians are perhaps too timid. They are inclined to keep certain local data in their files and not make it available for fear that a meager sample may lead users of such data to wrong conclusions. For some purposes, even scanty information may suffice. Our constant search for *the one figure* which we call *"the average"* may be the reason of our extreme caution. For some purposes, less precisely determined local figures may prove useful if made available. Take this example pertaining to spraying of corn with the chemical 2,4-D to control weeds. The question was asked of farmers along with other farming practices. No attempt was made to tabulate it by counties, crop reporting districts, or the state. Even though precise results could not be obtained, I do believe some valuable information for county agents and specialists does lie dormant either in the state statistician's office or in Washington, D.C. Perhaps the extension specialist in field crops is forced to make crude estimates or guesses about the use

of 2,4-D to control weeds in corn. He may even make guesses as to acreage and total gallons used.

Certainly those data good enough to be used for "administrative purposes" should be examined and perhaps made more use of than is the common practice today.

Examples of County Bulletins

Let me discuss some examples of good use of local data. In Wisconsin, a complete series of county bulletins has been prepared. These bulletins have been so popular and useful they have been reprinted three times. Each reprinting includes the latest census and other basic statistics for each township and/or county, depending upon the need and availability of detailed information. Generally, these bulletins are divided into five parts plus a classified index. Part I gives an interesting history and description of the county. It tells about the early settlers, their problems, population trends, climate, soils, and topography. Part II describes the pattern of agriculture as to trends in size of farms, general land use, farm tenancy, and farm values. Part III describes the crops grown in each town and for the county. The accompanying tables and charts are excellent sources for these local data. Part IV describes livestock and dairying. This section also contains valuable charts and tables of county figures for the important classes of livestock and their products. Part V describes farm income, level of living, marketing, and other miscellaneous economic and sociological information. The last page of the book carries some state and national data that can be used for comparative purposes to appraise or rate the county figures. After you have studied Wisconsin's county bulletins, you can see why they are so popular that reprinting and bringing them up to date are necessary.

Another example of making local data more available and useful is the series of county bulletins in Kentucky. There are 120 counties in Kentucky. To date, there have been published 31 bulletins. These are a nongovernmental series of bulletins. Let me quote from the introduction of one bulletin—the one prepared for Bell County:

> This report on agriculture in Bell County was prepared at the request of the Pineville and Middlesboro Chambers of Commerce. These organizations of civic-minded citizens of the county desired some information on the county's agriculture which would serve as a guide to planning a development program in this phase of their economy. This survey is an attempt to furnish the information desired.
>
> In this survey is compiled a limited amount of statistical data, a narrative account of certain facts and a few suggestions which can help to improve agriculture and increase farm income. All such surveys are more limited than may be desirable due to lack of available information. However, information contained should be sufficient to indicate present conditions and

future possibilities. The most important use of the survey is to serve as a basis for study and analysis of conditions and as a guide in planning the future development of the county in the field of agriculture. . . .[4]

The agricultural and other data included in the Kentucky county bulletins were limited quite largely to census figures. No detailed data by towns are included in the reports. On the whole, these reports do tell an interesting story and are certainly very useful to county people for planning purposes.

Because county figures are so vital to the business operations of the Grand League Federation, a large eastern farmers' purchasing cooperative, its board of directors spent a considerable sum of money to publish a special report[5] based upon the 1950 census. The tables and charts were rearranged to be most useful to G. L. F. personnel. Only those data were tabulated that would be most helpful to the cooperative in making important decisions and future plans. This suggests that we raise the question: "Can the census publish their reports in a more useable form?" It would save some of these reprint jobs.

Nongovernmental Data Available?

Up to this point, I have discussed making available existing local data that originate from the census or the federal-state departments of agriculture. But there are other sources. Canning and freezing concerns have local facts and figures about the acreage, yields, and prices paid to growers for contract crops. Hatcheries and dressing plants can supply accurate figures on baby chicks and dressed poultry. Milk and cheese plants can supply production and price information for dairy products. Grain elevators can supply stocks and movement of various grains. A great many business concerns like those mentioned above do send their figures to the state statistician, provided he limits them to state tabulations or for administrative use only. They fear local publication will disclose their volume to their competitors. I believe there are ways to publish some of these data locally and still give the business firms the protection they feel they need. It may mean the use of index numbers and percentages rather than the raw data.

Summary

I wish to issue a challenge to census officials to heed the voices of the state statisticians, extension economists, researchers, business concerns,

[4] Agriculture in Bell County by Woodrow McIntosh, Division Farm Service Adviser, Kentucky Utilities Company, Inc., Lexington, Ky., Published November, 1953.

[5] Report on 1950 U. S. Census for G. L. F. Personnel, Cooperative G. L. F. Exchange, Inc., Ithaca, New York.

and others . . . to publish data for minor civil divisions as well as county, state, and national totals. They should also make it more generally known that detailed minor civil division data can be purchased at a reasonable cost. The census should seek support from all of us to get a larger federal appropriation so its work can expand with the growing needs of today and not be forced to stagnate or curtail its functions.

May I also challenge those state statisticians who fear the cold plunge into county statistics. They should make a beginning by personally taking leadership responsibilities in gaining support and appropriations for that purpose. Some states that do publish county figures have no better data than those that do not. But they have obtained the necessary cooperative funds to publish county figures and are better servicing agriculture. As a corollary, I would like to suggest the expansion of the "intentions reports." More crops, especially the short season vegetable crops, should be surveyed at frequent intervals and details of intended acreages disclosed for small local areas. This could easily save vegetable growers thousands of dollars annually if they could learn ahead of planting time the "intended" number of acres that are forecast for their crops in their locality and also in competitive areas farther away.

While I am issuing challenges to other government agencies, I want to do likewise to my own—the state and federal extension services. We are delinquent in our responsibilities as an educational agency because we do not stress the need for farmer cooperation in supplying enough crop and livestock information to the crop reporting services. It is our job to convince crop reporters that their reports are vital and necessary. We must obtain sufficient and accurate information to permit the publication of useful minor civil division and county data upon which we in turn can plan sound county agricultural extension programs. Our research and extension programs are no better than the local facts and figures we have to base them on in our county plans for cooperative extension work.

NEW DATA REQUIREMENTS BY AREAS: HOW CAN THEY BE MET?

GEORGE T. BLANCH
Utah State Agricultural College

YOU may consider this report a continuation of the paper on agricultural data given at the meetings of this Association a year ago.[1] Some of the data that I will present were collected and used by Ebling and Ahlgren. I will, however, use the data in a different manner.

In preparing for their presentation a year ago Ebling and Ahlgren sent a questionnaire to each state statistician. One question asked was: "What types of requests for data have you had which you cannot supply now? (a) for the state; (b) for counties or other within-state areas." Copies of the replies of 26 state statisticians have been made available to me. In this paper I assume that the types of data requested that could not be supplied are the types that are required.

What kinds of data were listed? The range was from production resources to data on consumption. They were not easily classified into types. I am not certain that any two statements were intended to mean exactly the same thing. In spite of this I have included all of them under four general headings. These are: (1) data pertaining to the resources used in agricultural production; (2) data pertaining to production practices, costs and quantities, and other characteristics of commodities produced; (3) data pertaining to the marketing of farm products; and (4) miscellaneous.

Types of Data Unable to Supply: State Basis

What kinds of data for states were the statisticians unable to supply? A total of 115 items were reported (table 1).

Of those data needed that pertained to production resources, the number of specific machines, the number of specific kinds of livestock, land values, and land use were mentioned most frequently. Farm credit was not listed at all.

Yields and production of crops; production practices, and costs including amounts, kinds, and costs of fertilizer, insecticides, and herbicides used, varieties of crops, breeds of livestock, and data for minor crops were most frequently listed. Preharvest estimates of quality aspects of crops, such as protein content of wheat, and feeding value of feed crops were also listed. Losses from the death of livestock and from insects, diseases, hail, and floods were included.

[1] Walter H. Ebling and Henry L. Ahlgren, Agricultural Data Requirements—National, State and County, *Journal of Farm Economics*, 36:1226-1239, December 1954.

In the field of marketing, need for data on prices and income showed up most frequently. Marketing channels, methods and stocks in storage or storage facilities, were next most frequent. Data necessary to answer requests for information pertaining to quality of crops marketed and the interstate movement of products were not available.

TABLE 1. FREQUENCY OF LISTING REQUESTS FOR AGRICULTURAL DATA THAT COULD NOT BE SUPPLIED BY PRODUCTION STAGES AT STATE AND COUNTY LEVEL

Production stage	Data at level of	
	State	County
	(number)	(number)
Resources used in production	13	14
Production	60	53
Marketing	38	30
Miscellaneous	4	6
Total	115	103

Types of Data Unable to Supply: County Basis

Table 1 indicates that there was little difference in the kinds of data requested but unavailable at state and county levels. However, the breakdown within the major groups shows some differences that may be significant. Within the production resources group, 11 of the 14 reports had to do with numbers of livestock at the county level compared with 3 of 13 at the state level. Similarly in the area of production, at the county level 83 percent of the 53 reports pertained to acreage, yields, or total production compared with 50 percent at the state level. In the marketing area, 63 percent of the 30 replies were about prices or incomes at the county level compared with 29 percent at the state level.

I interpret this as a need for county data of the kind that is generally available for the state. For example, one state statistician was unable to meet requests for production data at both the state and county levels. At the state level it was: "Preharvest buckwheat forecasts; periodic production forecasts of select flowers grown under glass; winter barley acreage and production." At the county level it was: "Apple production by varieties; production of many other fruit and vegetable crops; milk cow numbers; acreage and production of major field crops." At the state level minor crops were listed fairly frequently, but not at all at the county level.

Another reporter listed for the county level among other things the following: "County or district breakdown of all current crop and livestock reports—from acreage and numbers to income." Twenty-three of the 26 statisticians who sent in reports listed some data similar to the above under county needs.

New Work Statisticians Would Like to Undertake

In the same survey the state statisticians were asked, "If more resources were available for new work, what would you like to undertake in your state?" This was to be reported for the state and also for counties or other within-state areas. Some of the statisticians were rather cautious in their responses to this query. This is understandable when we note that the assumption gives no indication of the extent of additional resources.

In spite of the limitations in these replies, I classified the work they listed into the same groups as used in table 1. In general outline the new work they would do follows rather closely the needs as indicated by the requests for data they cannot supply now (table 2). Most of the

TABLE 2. NEW WORK STATE STATISTICIANS WOULD LIKE TO UNDERTAKE IF MORE RESOURCES WERE AVAILABLE, BY STAGE OF PRODUCTION AND BY STATE AND COUNTY

Stage of production	Number of items listed	
	State	County
Production resources	6	7
Production	28	29
Marketing	10	13
Miscellaneous	14	9
Total	58	58

new work would provide livestock numbers, acres, yields, production, prices, and income. On the state level these data would largely be obtained for the so-called minor crops and livestock whereas at the county level they would apply more to the major crops and livestock. Also on the state level more attention would be given crop varieties; breeds of livestock; amounts, kinds, cost, and use made of fertilizers; insecticides, and quality of crops.

In addition to these similarities and differences the replies point up for both the state and county levels a problem that I think is significant. The essence of the problem is whether additional resources that might become available should be used to add new lines of work, or whether these resources should be used to improve the accuracy and the dissemination of the data being collected now.

I quote a few state statisticians on this. "I would prefer that any additional resources be applied towards doing a better basic job for items already on the program. Resources spread too thin." Another wrote: "Additional estimates do not appear to be the greatest need. More resources should be directed to the improvement of present estimates.

Particularly in the field of prices, both paid and received, far too many estimates are made without even a reasonably sound basis. Various aspects of the crop and livestock reporting could also be improved." From another state: "For counties, our mailed samples must be increased to improve all estimates at the county level. Also a publication should be available for each county, showing the agricultural history of each county." One final quotation: "We need to spend more resources to improve forecasts and estimates already on the calendar, too much 'dilution' during past 20 years, also carry on additional experimental activities leading to better estimates."

Would you prefer more data of doubtful accuracy or less data of greater reliability? The choice is not an easy one to make. Much depends upon how the data are to be used.

New Data Needed: Agricultural Data Committee

About the first of May this year the chairman of the Agricultural Data Committee sent an inquiry to the committee members. Among other things he asked four questions as follows:

I. What new data on agriculture not now available are needed for your state?
II. For the new data items wanted (Question I above) for which ones do you need (a) county estimates, and (b) estimates for other subdivisions of the state?
III. For the new data wanted (Question I above) for which ones do you need estimates more often than annually?
IV. Through what agencies can these new data be supplied?

The summarized results are presented in table 3. The committee agrees with state statisticians that needs for production data are greatest. The

TABLE 3. NEW AGRICULTURAL DATA NEEDED BY GEOGRAPHIC AREAS, FREQUENCY OF REPORTS, AND WHO SHOULD SUPPLY. FREQUENCY OF LISTING BY A.F.E.A. AGRICULTURAL DATA COMMITTEE

Data pertaining to	Needed for			Time of reports		Can be supplied by		
	State	County	Other Division	Annual	Oftener	Census	Agr. est.	Other
	No.	No.	No.	No.	No.	No.	No.	No.
Production resources	2	7	1	6	2	3	7	0
Production	11	19	7	25	8	1	31	0
Marketing	0	3	0	2	1	0	5	0
Miscellaneous	1	3	0	2	2	0	4	2
Total	14	32	8	35	13	4	64	2

committee emphasized to a greater extent the need for data pertaining to production practices and costs. Relatively, the committee thought there is greater need for data pertaining to resources, particularly land and

labor. They minimized the need for marketing data, however. Price and income data were all that were mentioned in this area. The miscellaneous data needed included off-farm income, kinds and costs of insurance, and long-range price projections.

Geographic Variation in Data Requirements

Some folks interested in this problem have suggested that the kinds of agricultural data needed differ among regions of the country. I was not able to discern any tendency toward regionalization in replies to the inquiries. True, crops differ and a crop that is major in one state may be minor in another but kinds of information desired about crops seem to be the same. Differences of this kind are found within states as well as among states. It might be that an inquiry designed especially for this purpose would reveal some differences; but they are not evident from the information now available. It probably was once true that only the states west of the 100th meridian were interested in irrigation; but this is no longer true.

Summary of New Data Needed

Let us try to summarize the major ideas on new data needs as gleaned from our two sources of information.

1. There seems to be a substantial need to make available on a county, or other subdivision, basic data of the kind now reported only for the state.
2. Make available for "minor" crops the kind of data now available only for "major" crops.
3. Refine collection and reporting of current type of data for major crops and livestock to specific crop varieties and breeds of livestock. (The crops and livestock not specified.)
4. Collect and report prices received for meat animals and some crops by grade of produce, place, method and form of sale.
5. Information is needed on the amount, kind and cost of fertilizers and insecticides used on specific crops.
6. We need to know the number of certain machines and pieces of equipment.
7. Preharvest reports are needed on quality of crops such as protein content of wheat, feeding value of corn, oil content of soybeans.
8. Feed production from pastures.
9. Forest production.
10. Livestock deaths and losses to crops and livestock from disease, insects, floods, and other causes.
11. The extent of interstate movements (imports-exports) of agricultural products.
12. More information (indexes) of prices paid by farmers. This would include custom rates for specific jobs and labor costs.
13. Off-farm incomes to farm families.
14. Per capita consumption of selected products for states.

Adequacy of Reports

You must be aware, as I am, that the data presented have limitations for the purposes at hand. We could itemize the weaknesses but this would add little to our understanding of new agricultural data needs. It probably is sufficient to say that at the present time we have nothing better to offer. I, however, have been impressed with the general agreement among the committee and others with the main ideas brought out by the surveys.

Determination of Needs

In the final analysis there are, of course, no such things as precisely defined needs or requirements for agricultural data. Even if there were they would not remain fixed. In this respect this problem is similar to requirements for education, traffic control, social security, and scores of other social phenomena. What we have is an opinion held by each citizen. Men's opinions necessarily vary with their background of training and experiences, their understanding of the problem, or how they think it affects their welfare. In the absence of any specific understanding of the problem a man's opinion may be based on his general philosophy of the place of government in activities of society. Slowly and haltingly these opinions in time become crystalized into needs and into action programs.

Agricultural data requirements of the congressman who must vote on an agricultural bill may be far different from requirements of the farmer who may need to make adjustments in his farming operations because of the bill. Both, however, need agricultural data as do many others.

It seems to me that we might think of needs for agricultural data at four levels. One is at the national level. Here the national policies, laws and administrative regulations are formalized. Data are needed for this. In most cases the data are needed to show for the nation amounts and trends over time. Regional or state data are of limited importance except as they show problems of national significance. National data may need be related to world data.

The state is a second level. Here state legislators and administrators, land grant colleges, and farmers' organizations formalize policies and programs for the state. The kind of data needed is similar to that needed at the national level. Data for the state are of major importance and county data of minor concern. State data, however, must be related to national conditions.

A third level is the professional worker in agriculture—county agents, the extension specialists, F.H.A. administrators, fieldmen for various companies, research workers, and others. These men get much closer to the

day-to-day functioning of the agricultural business. Since their work is largely educational or advisory they tend to work with groups rather than with individuals. They definitely need localized data in addition to state and national data. The county agent primarily needs data for his county.

The fourth and final level is the farmer and the business man who need data to help them in making management decisions. They need county, state, and national data to make some decisions. Other decisions may be based on data for a much more restricted area. Data for a minor civil division are sometimes too inclusive for a farmer or group of farmers. The significant point is that these are data that are of little or no concern to the users of agricultural data at the national or state level.

It appears to me that collection of agricultural data was designed first of all to meet needs at the first or national level. We are now at the point where the individual business man, farmer and corporation want and need more data to assist them in making business decisions. From these sources come requests for localized data—county and minor civil divisions. Also they need data on minor crops, crop varieties, breeds, production practices, and prices. Crops that are minor at the state level are sometimes major for some producers and processors. National or even state prices aren't adequate for resource planning on a specific farm.

With widespread programs of research, extension, and service in agriculture, uses and needs for agricultural data by professional workers are greatly expanded. Capacity to observe, and techniques to measure and record differences are literally the only limit to data these workers need. In many cases problems of distinguishing, measuring, and recording differences are so technical that the task of providing data is left to technicians. This will no doubt always be the case. However, this class of worker also uses and needs much data of the kind needed and used by the business man. The question that arises is how far the public should go to provide data for special groups and purposes. Our needs for agricultural data can be as great as our ability to provide and use them.

A Look Ahead

Agricultural data of the kinds we have been discussing are collected and disseminated largely at public expense. Experience indicates that except in cases of emergencies changes come slowly—but they do come. Our concern, I believe, should be at least as much with the direction of changes as with the extent. What can this group do to influence change in the right direction? The first thing is to be in agreement as to direction.

From various reports reviewed five possibilities are suggested. These are: (1) Expand collection of the present type of data to include minor

crops and other selected items. (2) Collect and report data for essentially the same items as at present but report on county or other state subdivisions. (3) Maintain the present system but increase and improve samples and otherwise do a better job. (4) Maintain present collection and analysis but do a better job of publishing and disseminating results. (5) All or any combination of the above.

I am sure that a good case can be made for following each of these possibilities. It is doubtful, however, that sufficient funds will soon be available to do all these things. This is probably a situation in which we should follow the idea of the greatest good for the greatest number.

My limited experience and understanding lead me to think that a high priority should be given to improving the usability of some of our present data. Inaccurate data or data that include dissimilar phenomena are sometimes worse than no data. Too often when a figure appears in print all questions of reliability and relevance are forgotten.

Second priority in my opinion should be given to obtaining data for the major crops and livestock on a local basis. These are the data needed by farmers and those that work with them for farm and business planning.

The county is the natural unit for reporting such data. However, where funds are limited it seems to me that a larger unit can often be used satisfactorily. It is assumed that census data will continue to be available for counties and to an extent for minor civil divisions. A type-of-farming area should make a good unit. The economic areas as established by the census may be adequate. The agricultural estimates reporting districts if properly delineated could also serve.

In a number of cases certain basic data are being made available on a county basis largely through the cooperation of state statisticians and state extension service employees. Such projects seem to work out well in many cases.

General Conclusions

From what we know about the agricultural data problem a few conclusions can be safely drawn. One is that there is demand for widening the coverage of items included in our data reporting system. Also there is demand for reporting some data more frequently, more widely, more promptly, and for smaller geographic areas. The demand seems to be especially strong for data to assist farmers and allied business men to make business decisions. The need for collecting and reporting separately some data that are now lumped together is evident. Improvement in sampling and resulting reliability is another need. Most agricultural data now available are supplied by the Bureau of the Census or the Agricultural Estimates Division of A.M.S. No change in this has been

proposed. Apparently Agricultural Estimates will be expected to supply most of the new types of data needed.

Another conclusion that is probably safe is that we need more information about our needs before deciding what they are or how they can be met. We need ideas from more types of users of agricultural data. I probably need more information about what data we now have and the extent of its uses. We definitely need more widespread discussion of the problem within each state. These thoughts suggest that we need some research on the problem. This can be of a formalized type though it need not be. There is in the western states a formal regional research project in livestock market information. This covers present information, its uses and limitations, and how the limitations can be overcome. It is just getting started. A few projects of this kind plus an active interest in the problem by all concerned would soon enable us to state with greater assurance our "new data requirements by areas" and "how they can be met."

LOCAL DATA WANTED BY BUSINESS FIRMS

DORRIS D. BROWN
Mutual Federation of Independent Cooperatives, Inc.

MANAGERS of business firms in industry like managers of farm firms make decisions that attempt to maximize profits for the firm. Failure to maximize profits in the long run means either that owners of capital in the business firm receive a lower return on their investment, or that new management or new management decisions are in order. The major difference in decisions of business firm managers and farm firm managers is in magnitude. Business firm decisions usually involve a larger volume of resources and effect many more people.

For example, a problem now being considered for a decision in my organization involves directly more than 60,000 dairy farmers, their families and their employees, thousands of milk marketers and their employees, and more than 15,000,000 consumers of fluid milk. Participating in this decision are the officers and employees of cooperatively organized business firms of dairy farmers; employees of proprietary business firms; city, state and federal public servants; individual dairy farmers and consumers.

A decision of this magnitude must be based on large volumes of local and regional factual data, properly analyzed and interpreted. Failure to have and to properly use economic data could result in short-run "windfall profits" to some segments of the industry, economic loss and stagnation to other segments of the industry, and a disruption in the orderly flow of goods and services to the consumer. Thus it is in the public interest to have available, on time, and to use large volumes of accurate and complete statistical data.

The data used in this decision include milk production by counties in the area, and the movement of this milk through the marketing system to the consumer. Data on costs and returns to the various marketers that perform different segments of the production and marketing functions, data on where consumers live, their work and their milk buying habits, are a part of the information needed. From these data it is desirable and usually necessary to predict the expected results of alternative rules and regulations that form a part of the ultimate decision. Thus the statistical data are used to report the past experiences up to the moment of decision and to predict expected results. Afterward, the new data are used to measure results and to make revisions in the program.

The data are supplied by the Crop Reporting Service, Census Bureau, milk market administrators (federal and state), experiment stations, dairy farmers, dairy industry business firms, and others. These sources can

usually furnish data regarding supply by months and by county in the area. They can usually furnish population data concerning the location and number of consumers by age groups. They usually make data available regarding utilization of the product.

However, even with this important contribution of data from government and industry sources, additional data would be helpful in improving the quality of decisions and in increasing returns to the public interest. In the case of the dairy industry, sufficient data are lacking to predict accurately the farmer's response or the consumer's response to price changes at the local level. Accurate and current local prices that fully reflect quality and marketing services for the entire market are not available. Supply in terms of milk cow numbers or volume marketed is not available on a minor civil division basis in many states. The lag between the occurrence of a statistical fact and its collection and release to the public causes many inaccurate decisions.

The industry example I have used illustrates the nature of some decisions made by business firms. The types of statistical data needed are not confined to the dairy industry or to this example.

In developing this paper a survey was made of a number of industrial organizations engaged in processing and marketing farm products or engaged in producing farm equipment or supplies. These business firms all make extensive use of statistical data collected by the Crop Reporting Service, the Census Bureau, and other governmental and private agencies.

The farm equipment industry makes extensive use of this type of governmental data to determine farm equipment needs by states and areas within the state and to determine sales quotas for the various units in their organization. Many of these business firms place the crop reporting data and Census of Agriculture data on IBM cards for their analytical purposes. It would be to their advantage to have more complete data on tractor and major farm equipment use by farms in counties, and to have these data available sooner than is usual after collection. These business firms make extensive use of "value of product sold by source."

Another business firm contacted, in this case a meat, poultry and oil seed processor, indicates that it makes extensive use of statistical data to determine plant location and plant size. It also uses this information in price analysis work and in educational programs. Business judgements and decisions of this type require a high degree of accuracy. To achieve this accuracy it is necessary for the statistical data to be highly dependable and available on time and in the greatest possible detail relating to the minor civil divisions under consideration.

Another business firm surveyed is engaged in activities relating to production and marketing research in education for one of our major

commodities. It is most active in the fields of increasing consumer use of the product and in improving efficiency of production and marketing of the commodity. It reports extensive use of data from the Crop Reporting Service and the Census Bureau relating to states and the nation. It does not make extensive use of minor civil division data. The firm would be helped by having more data available on an economic area basis and by greater accuracy and timeliness in reports.

Another problem uncovered by this survey of business firms using agricultural data is that definitions and collection procedure is not standardized as among states or economic areas. This is not to mean that complete standardization is desirable or necessary. On the major items, however, particularly those reported by states, it seems desirable that definitions be identical and survey techniques provide the same degree of dependableness. This amount of standardization would still permit variation in the collection and use of local data as applied to the state and areas within the state. Business firms would like to have a hundred pounds of milk in New York mean exactly the same as one hundred pounds of milk in Wisconsin. In a number of cases such information does not carry the same meaning.

Business firms need more local data than is now available to improve decisions such as plant location and size, current and future plant operations in terms of time, volume and quality of the commodity in production, and form and place of marketing.

Most business firms are involved in interstate trade, or their operations are in competition with other firms in interstate trade. Production of most commodities varies within and among local minor civil divisions. Variety, stage of ripening, volume of production, quality, etc., vary with topography, soils, water, weather, and other physical and biological factors. Data such as these would be more helpful to industry if available by local areas.

Additional data are needed by business firms, and no doubt also by farm firms, for the so-called minor farm commodities. The items included here would be such things as expected supply, harvest date and price data for onions, local fruit production, forest products and vegetables.

NEEDED CHANGES IN STATE AND LOCAL CROP AND LIVESTOCK REPORTS

FRANCIS A. KUTISH
Iowa State College

OUTLOOK work involves an appraisal of all the facts and estimates about current and prospective demand, production and price trends, and the effect of government programs; so that the individual or family having access to outlook can make the best possible estimate of what is going to happen in the future. As such, outlook depends heavily upon accurate and timely information about crop and livestock production and price prospects.

During the past decade—and especially during the last 5 years—we have experienced a rapid growth in the acceptance of outlook. Nearly every farm magazine has an outlook section. Television and radio stations carry regular outlook programs. Newspapers have outlook columns. Private industry and agricultural colleges have expanded their outlook activity. The average farmer is brought in contact with outlook regularly; and he is paying more attention to it in making his farm plans.

This places additional demands upon the scope and accuracy of state and local crop and livestock reports. Let us break down the problem into three segments: Can we improve the accuracy of the estimates now being made? Can we make changes in the timing of the reports now being made? Can we increase the amount of information collected?

In considering this problem, let us make clear that our sights are set to the future; and let us begin with the accuracy of reports. This part of the problem has become more important with the increased use of outlook. I believe that most state and federal statisticians are aware of the need for re-evaluating the statistical methods now used in developing crop and livestock estimates. They know that the methods in use are not generally followed by groups having more resources and more time. Possibilities of using sampling methods with field interviews should be explored.

I want to underline the fact that the Crop and Livestock Reporting Service simply cannot shift its statistical methods with its present facilities. The public needs to be awakened to a general awareness of the problem; then this awakening needs to be translated into additional appropriations for this purpose.

Another point. Economists have a general misunderstanding of the quality of some of the statistics gathered by the Crop and Livestock Reporting Service. They demand to use statistics that are not accurate enough for the purposes that the economists want to apply. This is par-

ticularly true of the calls for a breakdown of the state figures into areas of the state. The statistics of the minor crops likewise often fall into this class. These data are subject to great error.

How would further improvement in the accuracy of crop and livestock estimates help in outlook? If the corn crop in the eastern Corn Belt is large, for example, corn will move from Ohio and Indiana to the eastern market, instead of from Chicago. This tends to make Chicago corn prices weak. Thus if the eastern Corn Belt corn crop is underestimated, the cash corn market in Iowa and Illinois will be weaker than would otherwise be the case. Some people believe that this is a part of the explanation of why the corn market was weaker this spring than had been expected earlier. Also it has been hard to make the 1955 grain feed and soybean disappearance figures jibe with the 1954 crop estimates and the 1955 feed needs.

Among the livestock reports, we need to study the pig crop survey techniques. Are they the best that can be used? We should be able to forecast monthly slaughter better than we are now doing.

Before I leave this point, I want to emphasize again that I believe that the Crop and Livestock Reporting Service has done a good job in general, considering the facilities with which they have to work. My plea is for more adequate facilities so they can overhaul their methods.

Now let us turn to the timing and content problem:

The biggest change needed in livestock reports is in the Pig Crop Report. We who do outlook work applaud the Crop and Livestock Reporting Service for investigating this quarterly survey. The seven-state report on farrowings that comes out quarterly is a big help.

But we need to go further. The major problem is one of estimating future supplies. To do this, we need more monthly information on farrowings.

For example, the June pig survery and the December pig survey report the number of litters farrowed by months during the previous six months. This is fine. But by the time the data are released, some of the pigs that were born during the first months of that period are about ready to go to market. This shortcoming would be remedied if the farrowing intentions for the succeeding six months also would be listed according to the months in which the farrowing were intended. Then a producer would have some idea of the number of hogs likely to come to market when his are ready to sell. The number of pigs saved per sow varies from month to month, depending upon the weather and many other causes. Why not report the pig crop monthly, not just sows farrowed?

The seven-state quarterly pig survey would be more useful if information were regularly gathered on these questions:

How many *pigs were born* in *each month* of the last three months?
How many *sows were bred* in *each month* of the last three months?
How many sows do you *intend to have bred* in *each month* of the next three months?

By using the monthly data on sows bred, pigs born and the intentions on breeding, we could project ahead what the prospective supply is likely to be. This would give farmers a more accurate indication of what to expect in the way of supplies and prices far enough ahead so they could use the outlook material in timing their production plans as well as their marketing plans.

In the case of cattle, the recent step to include data on the weight of cattle on feed in the fourteen states, and the length of time on feed, should provide a much more accurate basis for estimating cattle marketings from the feed lots. Perhaps the figures could be further refined also by breaking down the length of time on feed according to weights of cattle; and we need a clear definition of what constitutes "on feed."

There is one area where we really have a gap in our cattle reports. We know little about the number, size and availability of feeder cattle. Nor do we have much idea of the timing as to when they are likely to come to market. Admittedly, this is a tough problem. But it is one to which we need to give serious thought. Perhaps the problem cannot be solved because of the widespread nature of the cattle-growing industry. But it should receive our serious consideration.

In general, our experience has been that the additional data on marketing intensions have been the least worthwhile of the recent steps taken to increase the amount of information under the Research and Marketing Act. Farmers often change their minds as to when to market. Our experience in two years of interviewing farmers in Iowa and northern Illinois, in a project financed by the Chicago Union Stock Yards and conducted by Iowa State College, leads us to believe that marketing intentions are much less reliable indicators of marketings than are production or inventory data. Perhaps the series on marketing intentions should be discontinued and the funds released transferred to other purposes.

In the case of crops, we need a more accurate measure of the quality of our feed grains, as well as the quantity. Farmers commented about the good feeding qualities of the 1954 corn crop, for example, as contrasted with years in which we had high moisture or a soft corn crop. The same number of bushels in different years can mean a substantial difference in the actual feeding ability of the harvests. Thus, we get fast disappearance in years of a low feeding quality crop and a slower disappearance in the years of a higher feeding quality. During the growing season, we need more frequent crop estimates than once a month. Weather conditions may

be hot and dry on the 1st of August, for example; then on August 3 it rains. A special crop estimate on August 15, or even sooner, might be made in such cases.

The amount of corn on the ground salvaged by livestock constitutes another problem. Estimates of the average amount left in the field run as high as 10 to 15 bushels per acre—even more in years when there are high winds just before picking. If this corn is salvaged by livestock, obviously the effective crop is larger than if it isn't. This should be taken into account in the crop estimate.

At times, it becomes quite important within a state to have some idea of the distribution of the crop within that state. Thus, southern Iowa may have an enirely different feed situation from northern Iowa. We need to develop some other breakdown of the state data to provide this analysis within states.

In all of these reports, "time is of the essence." I wonder if the dates of release could not be speeded up by a careful evaluation and removal of needless processes, and by the use of wire service and telephone to communicate between state and USDA.

One final thought: As more accurate information about future supplies becomes available and is used for effective price forecasting, farmers will tend to react to this. The effect of their actions will be to make the *forecast* appear in error. But the net effect should be to even out supplies—and thus benefit both consumers and producers.

I have tried to outline some of the needed changes in crop and livestock reports. These suggestions have been presented from the point of constructive criticism. We who use the data, and you who collect and make these estimates, both have the same goal—the best job possible of providing accurate, timely crop and livestock production reports. Let us join our hands and work together toward that end.

DISCUSSION: MAKING EXISTING LOCAL DATA MORE AVAILABLE AND USEFUL

R. K. SMITH
Agricultural Estimates Division, Agricultural Marketing Service

I find myself in agreement with much of what Dr. Beck has presented. I particularly hope his last challenge to state and federal extension services will be taken up.

The extension service grass roots study being made between now and January 1 in 10 percent of the counties is something new to me. I am sure this study will again call attention to the need for more agricultural facts at the local level. I would like to ask if any plans have been made to record these needs as this study progresses so they could be combined into a picture of

total needs. I believe such information, developed as a result of a nation-wide grass roots study, would be quite useful to the A.F.E.A. committee and others attempting to find an answer to this problem. The holes in the local data reservoir will vary widely by states but such a study could well pinpoint the needs as they tie into the broad extension program of farm and home planning. Think how much more effective the program could be in the remaining 90 percent of the counties if some of the gaps could be plugged because of what was learned in this study. Dr. Beck's concluding statement on a similar panel discussion last year seems quite appropriate here. I quote: "Perhaps it would be a wiser use of federal funds to develop the county data more adequately before expanding farm and home planning too far."

The results of the A.F.E.A. committee's recent survey were not available until Dr. Blanch presented them here; but after being in this business for years it is not difficult to predict what the answers would show. I notice many of the items are the same as mentioned last year. Most of them are listed in a letter from the Agricultural Statistician for Illinois that I have with me. When he mailed out his annual statistical bulletin, which includes a good coverage of county data in addition to state series, he sent along an inquiry to find out what use was being made of the data, whether or not certain series might be discontinued because no longer used extensively, and what other types of county and state data were needed. He received a large response and practically all users of the bulletin wanted all the series continued. In addition he ended up with a long list of additional items on which county estimates were desired and an even longer list of additional things wanted at the state level. A few of the items requested will be available in the 1954 census publications now being issued but most of them will not. Some that are published by the Census Bureau are apparently desired more frequently. What I am getting at is this: There is and has been for years a great backlog of unfilled demand for more local and state statistical data on agriculture. We have made progress but we have just nibbled at the pile. To meet this demand all at once would require more than double the present amount spent annually by the Agricultural Estimates Division and cooperating state agencies for collection and publication of statistics. This amounts to between 4½ and 5 million dollars. Of course the needs would vary greatly but even a state like Wisconsin, which has been held up here as a model, still has unmet demands.

Such an increase in funds is not going to be obtained in one year and, even if it were, it would be impossible to find the trained personnel to man such an enlarged operation. But there should be a setting up of priorities, and a coordinated program aimed at meeting the most urgent needs in two to four years with others to follow. Some of the demands can probably never be met fully and many may not need to be; but a plan is necessary. This plan should include training of personnel.

I do not believe it is possible to fill even the most urgent demands for additional local and state data by a program that depends mostly on state or local funds. We have come a long way in the past 25 years in cooperative state statistical programs but in some states there is little hope for any sizeable appropriations for such work. I am not saying that further progress in this direction cannot be made, particularly under the matching funds provisions of the Agricultural Marketing Act, but such progress is bound to be slow and will still leave many gaps.

This is perhaps where I differ with Dr. Beck. I must admit that we usually take the position that county or other local data should be the responsibility of the states. That is still a good goal. But with the greatly expanded extension program supported largely by federal funds, and with the growing demand for more local planning, the development of local facts and figures will never keep up unless the cost is largely covered by federal funds. And the start will have to be made soon. To insure proper coordination, such expanded program should be tied in closely with the existing collection activities of the Agricultural Estimates Division and the Census Bureau. In fact, the usefulness of most agricultural data now collected by other agencies would be improved if the agricultural statisticians were drawn in more frequently.

I am not sure just what Dr. Beck means when he states, "The state statistician is the person who must take aggressive leadership; . . ." Certainly, such leadership is important in determining what the needs are, what things come first, and how demands can best be met. But he has to have the farm organizations, the extension service, the agricultural college, and others interested in agriculture right beside him when the requests are made for facilities to meet the demands. The users of the data should assist in determining priorities and take an active part in educating those who provide the facilities to get the job done.

I would like to emphasize that this matter of meeting the demand for more local agricultural data involves much more than making available data now on file in the state statistician's office. There is some of such data available to be sure; and I have felt there are sometimes local data that could be made available with little additional work. In some cases this may be unpublished county data worked up for administrative purposes. But once the statistics are published they must stand the test of all users. Estimates based on meager samples might be all right if you knew who was going to use them and how they were to be used; but once they are published they become public property with no strings attached.

Our state statisticians do have on file in their offices a great deal of information developed as a by-product of the state estimates; data that could be released to the public on a crop reporting district basis or even a county basis if resources were available for proper analysis and for putting them in form for publication. There is much information that might be reworked to meet special needs, such as have been mentioned here. But this must be done by those who know the data, how they were collected, what dependence can be placed on them, etc. With the Reporting Service issuing over 500 reports a year, and the states issuing many special reports in addition, present resources are not adequate for such special individual service.

Mention was made of greater confidence and reliability in local data in states where local assessors gather agricultural data in a systematic and effective manner. There are 14 states where the assessors make an annual enumeration of crop acreages and about twice this many where records are available on the number of livestock assessed. As assessment systems change we have fewer and fewer states with assessment data on livestock. A number of states are having difficulty in holding a satisfactory method of enumerating crop acreages by the assessors. A few years ago North Carolina lost hers entirely. It was restored only after a concerted drive by all agricultural interests in the state. Such support is needed in other states right now for there is constant

pressure to curtail or eliminate this requirement on the assessors.

I wish to add just a word about census minor civil division (M.C.D.) data. I have been close to the operations of the Census Bureau in the last 4 censuses of agriculture. I have seen the pressures develop that resulted in discontinuing publication of some census data, particularly those on an M.C.D. basis. This was entirely the result of pressures to economize. I do not believe many of those in the Census Bureau who are responsible for the data really wanted to drop publication of such M.C.D. data as were valid. They were forced to do so because the money provided would not do the whole job and priorities had to be set. M.C.D. data got a low priority because of lack of support. I think the challenge here should be issued for those who need the information to make their wants known in places that will provide the necessary funds. The Census Bureau does not have those facilities now.

DISCUSSION: NEW DATA REQUIREMENTS BY AREAS: HOW CAN THEY BE MET?

C. J. BORUM
Agricultural Marketing Service

Dr. Blanch's paper contains a very fine summarization of the questionnaires sent in by state statisticians about a year ago. As one of those statisticians, I am in general agreement with his summary and conclusions. I only wish to add a few comments from my viewpoint as a worker in this field.

The trend in demand for information of all kinds is for more detail. In my opinion, these unsatisfied demands will always be with us. As soon as one demand is met, others arise. There will always be a backlog of requests for more detailed data that are needed in making management decisions. Let us take an example. Forecasts of apple production are needed as an aid in marketing. But one does not just buy or sell apples in general. They are marketed as separate varieties and each variety has its own marketing problems, including date of ripening and relative supply-demand situation. At the present time there is an unmet demand for preharvest estimates of apples by principal varieties. During recent years the only official breakdown of apple production by varieties is made in late December. This is too late. Last year Michigan produced a below average crop of apples but the crop of Spies was the largest in several years, 65 percent above average. Production was not known early in the marketing season and, as a consequence of the slow selling policy of many growers, Spy prices at the end of the storage season were about 1/2 of the price at picking time.

Another type of unmet data requirement is one that could be used by state statisticians in making more accurate forecasts of production. We shall call this type, data for internal use. It is related to changing techniques of production. Let us illustrate with a specific example. About 3/4 of the Michigan strawberry acreage is located in the southwestern area. This year a freeze on May 9 killed the primary buds and blossoms of the unprotected acreage. The principal method of production is by sprinkler irrigation. Obviously if the irrigated acreage had prospects of a full crop and the non-irrigated acreage had prospects for less than 1/2 of a full crop, it would be desirable to know the approximate acreage of each in order to make a good forecast of production.

With our dynamic agriculture, these acreages and proportions change each year. With limited resources for obtaining more detailed information, a decision must be reached by the state statisticians whether or not to put more effort into obtaining this type of information by areas, for the primary purpose of increasing the accuracy of the strawberry estimate, or whether or not to divert his resources to external requests for other types of information.

My observation is that most requests from the public for additional data, whether on a state or on an area basis, assume that the costs will be met from federal funds. Contributions from state funds are relatively small in most instances. Sometimes there are demands for county and township data for a minor crop that is important in one or two counties. It has occurred to me that in those cases, some self help might be attempted. We observe many local volunteer leaders of farm and youth groups in worthwhile civic affairs other than in obtaining data pertaining to the agriculture of the township or county. In my opinion, some of the unmet needs for area data could be secured at little cost, by volunteer adult workers and youth groups, working under the general supervision of extension workers and the state statisticians.

DISCUSSION: LOCAL DATA WANTED BY BUSINESS FIRMS

MARVIN A. SCHAARS
University of Wisconsin

It is quite evident from Mr. Brown's paper that, based on his personal experience and that of business firms he contacted, there is a need for local data by business organizations. These data, as he states, are important in the decision making process. Unless such data are provided by agencies of government, business firms will collect the data through their own resources or go without them. For most firms, this means not getting the data. I concur with Mr. Brown that the need for data of minor civil divisions is needed. I had hoped that he might categorize the types of data of an MCD nature that business firms specifically seek. I feel certain that data on farmers' incomes, farm costs, farm equipment and machinery, use of fertilizer and insecticides, artificial breeding, grades and quality of marketable livestock and crops, farm and local storage, production and intentions to produce are among the data on a county and area basis that business firms desire.

Although data on a state and national basis are usable by many firms, data for minor civil divisions (counties, perhaps townships in some cases, and of contiguous areas where specific types of production occur) are especially meaningful to businesses that operate one or a few local plants and whose operations are confined to limited areas. Larger firms that buy or sell on a regional or national basis also have need for specific local data that are important in day-to-day plant operations and in projecting future operating plans.

Data needed for managerial decisions are of two kinds—historical and current data. Historical data are particularly valuable in deciding where to locate plants, engage in procurement operations, and where to establish sales territories. Current data, such as those provided monthly, or even biweekly, during the height of the harvesting or marketing season, are especially useful for gearing business operations to the current conditions affecting a going concern. The periodicity of such current data depends upon the type of production and marketing pattern of the product in question. Monthly information on

numbers of pigs born, sows to farrow and sows bred, to use one illustration, is of practical value to packers, traders and the meat trade in sizing up the market potential in months ahead. Other illustrations of this kind can be given where local data periodically obtained and released would greatly help to pin point the existing situations.

The need for local data has been emphasized in recent years as a result of the decentralization of marketing of a number of important farm products. When firms operated primarily in central markets data on a state basis were largely sufficient, for such information indicated rather well what might be expected in the way of marketings from the states supplying the central market. With decentralization, however, state data have become only partially helpful. A meat packing firm that wishes to decide where to locate a plant, a concentration yard, or a buying station in the producing area requires local data for such decision making. Firms engaged in storage operations that wish to decentralize their operations are also faced with the need for information by minor civil divisions.

Cooperatives that are consolidating their operations are also confronted with the problem of deciding where to locate. Again, local data on production, marketing trends and market movement of products would be helpful in making the decision. Local data are also useful in establishing *sales* quotas for salesmen and in setting up *procurement* quotas for field buyers of agricultural industries.

Mr. Brown referred to the lag between the occurrence of a fact and its final emergence as part of reported data. It is apparent to all of us that this lag must be shortened to a minimum if current data are to be of maximum use to business firms in adjusting their week-to-week operations. Thus, during the height of the contracting season for range cattle and western lambs, weekly data as to numbers of animals contracted, weights and kinds of cattle available for purchase, volume shipped and the like, by specific producing areas, would have to be released with dispatch if the data are to be useful to trade interests.

When we consider the dynamic nature of agricultural production and marketings (e.g., broilers, soybeans), it is quite apparent that census data on a 10 year or 5 year basis, except for historical use, are soon outdated and of limited value to businessmen for adjustments in their current operations. Two major needs of business firms are apparent, area-wise and time-wise data of both state and minor civil divisions.

DISCUSSION: NEEDED CHANGES IN STATE AND LOCAL CROP AND LIVESTOCK REPORTS

SAMUEL J. GILBERT
Iowa Agricultural Statistician, Des Moines

If an experienced agricultural estimates statistician had prepared and presented the paper given here by Francis Kutish, it is doubtful if there would be any noteworthy changes from Kutish's friendly, understanding and forward-looking contribution.

Certainly the day is past, as Kutish indicates, when the outlook approach is viewed more or less generally with fear that one may "stick his neck out" fatally. Also, one now seldom comes across the old and common reaction that

to forecast a condition is to cause it. Some of the reasons for these things may be that data are proving essentially more accurate than they used to be and along with this there may be an accumulatively improved know-how in the use of data.

On occasion one may hear an observation that "the data" are not good. Rather than blanket the Crop and Livestock Reporting Service *ipso facto* with the charge of inaccuracy—and Kutish certainly has avoided doing this—it is well to remember always that data should be reflected against the yardstick of required serviceability for the purpose the data are to serve. Try dropping some service such as popcorn and honey estimates and one will find that the trade insists on reinstatement of these "horrible" figures.

Futility of talk alone about need for greater accuracy, changes in timing and in data coverage, when these are needed, is recognized by Kutish when he urges additional funds. Also, he does not advocate the elimination of the old components of our statistical retaining wall until we have at least thoroughly tested and instituted, through parallel functioning, the qualities of the "new" ingredients of statistical procedure in our seawall containing the tides of demand for new kinds of data and for more nearly pin-pointed data in general.

It is pointed out that sometimes less than state data are desired from methods and samples that were developed for only state data. To refuse to accept the truism of sampling for a given use is tantamount to holding that the harness maker's needle is a poor thing because it fails to serve in the hemming of a bride's Irish linen handkerchief.

Suggestions are offered to illustrate the need for improved data, such as on the quality as well as the quantity of the feed and food crop corn. Kutish places great emphasis on the contribution already made by the now seven-state integrated state agricultural marketing act approach to quarterly sow farrowings; and he urges further developments, including monthly pig crops and intended farrowings by months. These suggestions fit into the plan or pattern of hoped for development as experience permits. It seems quite in order to make assurance that all of his other suggestions have also fallen in mighty fertile territory.

ADJUSTMENT PROBLEMS IN A GROWING ECONOMY

Chairman: R. C. Ross, University of Illinois

ADJUSTMENTS IN PRODUCTION TO A GROWING ECONOMY*

EARL O. HEADY
Iowa State College

AN OBVIOUS fact is that the nation's economy is growing rapidly. Since 1930, the gross national product has grown by 128 percent and disposable income has increased by 100 percent.[1] On the input side, the 1954 working force is 35 percent greater than 1930 and population is up 34 percent.[2] Short-run depression phenomena in the years ahead may retard economic growth in the United States. But aside from temporary set backs, continued and rapid growth in the national economy appears certain. The major variables in this expected economic growth over the next 25 years are: 1. An increase in population from 25 to 40 percent, depending on the estimate used, and a somewhat similar increase in the working force. 2. A continued or an increased tempo of technological change. 3. A large increase in the nation's capital plant. 4. An increase in gross national product upwards of 200 percent. Even if we discount these expectations considerably, this is apparent: The U. S. society and the consumer generally will be wealthier and will have an increasing living standard within grasp.

Relation of Agriculture

What is the role of agricultural production in an economy growing rapidly wealthier? Must it and will it keep pace with national economic growth? To predict outcomes in agricultural production is to predict demands for products of this sector as compared with other sectors of the national economy. This requires an analysis of resource use for the economy as a whole and an analysis of where in agriculture prices and incomes will be relatively depressed or inflated by a growing economy, since these are the controls likely to determine the long-run structure of agricultural production. Obviously this paper must be limited to a few generalizations, based on available empirical findings. As is apparent from past experience, however, economic growth causes some branches of agricultural production to expand, some to remain about as they are, and others to decline in income and in resources used.

---

* Journal paper J-4444 of the Iowa Agricultural Experiment Station, project 1135.

[1] In terms of values converted to constant dollars, 1947 = 100. Sources: U. S. Dept. of Commerce, *National Income*, 1954 Edition, pp. 162-163; and *Federal Reserve Bulletin*, June 1955.

[2] Source: *Handbook of Economic Statistics*, Vol. 8, No. 12, Dec. 1954.

Before tackling the central core of production reorganization, we pause to dismiss the major restraint of agriculture on economic growth; namely, the threat of population to press on food supplies. No facet of economic growth is likely to place heavy demands on agricultural products, relative to the flow of products from other sectors of the economy. The rate of population growth will not exceed, and very likely not keep pace with, the growth of technology in agriculture. Although they are probably conservative estimates of agricultural possibilities, both the USDA Capacity Study[3] and the President's Materials Policy Committee Report[4] indicate that increases in production can keep pace with, or more likely outdistance, increases in population over the next two and one-half decades. Even if present rates of population growth continue for the next five decades it is unlikely that the level of per capita food consumption would need to decline. With a sufficient increase in inputs, food production in the U. S. might well be pushed to a level allowing the present per capita consumption to be maintained for a population of 300 million or greater. While part of the increase would come from technological innovation, sufficient resources could be drawn from other industries to guarantee as much food in general and as many steaks, lettuce, fruit and other specific items per person as at the present. Hence starvation, or even a lowering of the food standard, is not a threat to, or a challenge of, agriculture. The challenge is in quite the opposite direction: it is one of ability to produce food to meet growing consumer demands with the same or fewer resources; so that the economy is guaranteed growth and progress in the form of more resources to be used for non-food goods and services which characterize a society in the upper reaches of economic development. We believe that this condition can be attained by agriculture. Food demand in the next 25 years is not likely to interact with food supply and cause agricultural prices and income to rise relative to the same quantities in other sectors of the economy. Quite the opposite is more likely. With shifts in the supply function outpacing shifts in the demand function, the current income situation in agriculture will be continued. Farming will be faced with a situation wherein incomes are depressed relatively. Although efficient farmers will earn favorable incomes, those possessing less capital and managerial abilities will be invited, through relatively depressed incomes, to transfer resources to economic sectors that produce commodities and services consistent with advanced stages of economic growth. A continued contribution of agriculture to national economic growth will be that of freeing labor resources (or in using only slightly increases in total resources) in order that economic development may be speeded elsewhere

[3] *Agriculture's Capacity to Produce,* U.S.D.A., Agr. Info. Bul. No. 88, Washington, D.C., June 1952.

[4] U. S. President's Materials Policy Commission, *Resources for Freedom,* Vol. 5.

in the nation. This freeing of labor resources will mean an aggregate agricultural product coming from fewer but more efficient commercial farms.

Income Elasticities

Neither population increases nor prospects in per capita consumption of agricultural products will cause large premiums to be placed on prices and incomes in agriculture. The income elasticity of demand for agricultural products in aggregate is too low at the U. S. stage of economic development for any great increase in per capita consumption of the aggregate farm product. Economic development and a growing national income can cause sizeable increases in per capita intake of food in nations such as Asia where hunger is often widespread. However, the elasticity coefficient declines with economic growth and a rise in family incomes. The high stage of economic development in the U. S. causes consumers to place more food at a low level in their ordering of wants. The elasticity coefficient for food in aggregate for the U. S. is somewhat less than 0.3. (Here we refer to the elasticity of the farm produced portion of food expenditures, as consumer incomes increase, and not to the nonfarm services that make up part of the price of food sold at retail.)[5] It is only slightly higher for all farm products (including nonfood commodities).[6] The coefficient will decline further as per capita incomes increase. This low elasticity, and the inability of our growing economy to spiral food consumption to any great level, is emphasized by the fact that food intake in pounds per person in the United States has not increased in 45 years. For all practical purposes the income elasticity coefficient is zero for food products in physical form.[7] There are more Americans who worry about overeating than there are who suffer hunger pangs. The period of economic growth ahead will cause the greatest relative increase in demand in nonagricultural industries where products have elasticity coefficients ranging upwards from 1.0 and characterize consumption patterns of a wealthy society.

[5] For predictions of income elasticities, see the following reports: T. W. Shultz, *Economic Organization of Agriculture*, New York: McGraw-Hill, 1953, p. 45; James Tobin, "A Statistical Demand Function for Food in the United States," *Journal of the Royal Statistical Society*, Vol. CXII, Part II; M. A. Girshick, and T. Haavelmo, "Statistical Analysis of the Demand for Food," *Econometrica*, Vol. XV, No. 2; B.A.E., *Misc. Pub. 691*, Aug. 1949.

[6] See G. Tintner, *"Multiple Regressions for Systems of Equations," Econometrica*, Vol. XIV. Tintner's estimate of the 1920-43 income elasticity coefficient is .307 for all farm product.

[7] Elasticity quantities mentioned in the text are in terms of monetary expenditures on foods relative to consumer incomes. Most of the increase in food expenditure, accompanying income increases, grows out of the shift to more costly foods, rather than an increase in bulk or mass of food per person.

Statements to this point merely emphasize that foreseeable growth of the U. S. economy will neither (1) be restricted by agricultural output in the sense of a Mathusian restraint on the size and quality of the labor force or (2) call for any greater increase in aggregate output than is now in sight from changes occasioned by the present rate of investment in capital and innovation for agriculture. Just as predictions of aggregate outcome may rest largely on the income elasticity of demand, this same coefficient can be used to suggest differential changes in the makeup of the aggregate agricultural product. Just as the makeup of the national product will have a relatively smaller agricultural component, so will the makeup of the aggregate agricultural product change if the demand structure of a growing economy can be reflected in prices.

Differential Change in Agricultural Products

Some products of agriculture are better geared to a growing econmy than are others. Continued economic development signals a much greater relative suppression of output and income, if not an absolute decline, for products with lowest income elasticities. Lowest in elasticity are those *inferior* goods such as fats and oils, potatoes and sweet potatoes, flour and some cereal products, dry beans and peas, salt sides and lard. Negative elasticity coefficients for these agricultural products foretell a further decline in per capita consumption as incomes of more consumers increase. Total demand for these *inferior* foods can be increased only if the rate of population growth offsets the negative elasticity coefficient. With current population prospects, it appears that absolute output of even inferior foods might not decline over a 25-year period of economic growth. Because of their *inferior* characteristics and the continued flow of technical advances, however, prices for these products will lag downward; returns to resources used in producing them will be depressed. Consequently, some outward transfer of resources, government programs allowing, will take place from these inferior commodities to industrial commodities and other farm products. Again, this transfer of resources need not mean a decline in volume of these inferior commodities; output will increase from 25 percent to 80 percent of the rate of population increase, depending on the product. These products will be produced with fewer resources on fewer but larger and more efficient farms. These will adopt new techniques and low cost resources services as they are forthcoming. The inferior good segments remaining in agriculture will be in those localities where the slope of the production curve favors the particular commodity relative to other farm commodities and nonfarm opportunities. For example, in fringe areas (fringe areas being defined as those with marginal rates of product substitution favoring wheat only

slightly now), where the slope of the production possibility curve currently gives only a slight profit advantage to wheat, shifts to feed grains (e.g. corn, grain sorghums, and barley), and to more grassland and grazing can be expected. Areas with particular advantages (i.e. high marginal rates of product substitution for wheat) in producing low grade wheat are likely to continue this crop specialization, but to use the grain in producing livestock products, products that have higher income elasticities and are better geared to a growing economy.

Similar adjustments can be expected for other inferior products of agriculture. Some resources from potato production can be expected to shift mainly to other vegetables or to general farming including livestock (depending on the location). Aside from possible expansion in industrial uses of fats and oils, products such as soybeans will contract relative to other crops in the Midwest, as perhaps will some varieties of peanuts in the Southeast. The inferior characteristics of lard will likely be offset by the relatively higher income elasticities for lean pork cuts. Economic growth also will further designate them as different products and dictate diversion of resources from lard-type to lean-type hogs. In selected dairy areas, economic growth should cause further diversion of resources from butterfat, an inferior product or near-inferior product, to milk products with higher demand elasticities.

Adjustments for products with low, positive income elasticities (i.e. from zero to 0.5) should be similar to the inferior-type commodities mentioned above, the difference being only one of degree. Included here are such items as sausage, bacon, wheat cereals, canned beans and peas, sugar and similar items.

Most favored by economic growth are those consumer products with high income elasticities. Some capital resources may actually be drawn to the farm commodities from which they are derived. Included here are products such as the lean cuts of pork, higher grades of beef and mutton, fresh vegetables and numerous fruits, particularly citrus fruits. Even where the products of this category do not attract a net addition of resources, output over an extended period of economic growth may considerably exceed the rate of population increase. This is true because their elasticities range from 0.5 to upwards of 1.0, and allow considerable increases in consumption per capita. Hence income premiums to the extent that they will exist in agriculture, will be for resources employed in livestock, vegetable and fruit production, commodities where the total supply of land adapted for production is smallest relative to potential demand. In this setting, the major livestock areas are well geared to a growing economy, whether these areas be the grazing regions from the Great Plains westward or the major hog-beef fattening region or the

major milk producting areas. These livestock regions, and particular fruit and vegetables areas have fewest adjustment problems ahead of them. Their production and resource-use structure is already geared in a direction to mesh with a growing economy. Even here, technical advance within agriculture, employment opportunities elsewhere, and increased labor mobility will cause production adjustment requiring less labor. Other regions, such as parts of the Southeast and the far West, will be encouraged to adjust to greater livestock production. However, increases in capital and managerial resources and in farm size will be required over important parts of these regions.

With its richer climatic resources, the Southeast could, under a long and sustained period of economic growth, draw away from a low-income structure of production to become the second (or perhaps even the first) ranking agricultural region. The main existing obstacles to this development are known: a large and fairly immobile labor force; too many small farms; capital limitations; tenure and other institutional restrictions; and income levels (a) that limit investment in education for greater managerial skills and other facets of the human resources and (b) that cause heavy discount rates on future incomes and encourage production of short-outlook, cash crops. Because of these restraints and because the Midwest now has per family income and capital levels allowing a more rapid capital accumulation, the latter region may gain much of this production potential that would otherwise be that of the Southeast, if the period of economic growth considered is as short as 20 years.

Location and Industrialization

Still, continued economic growth provides forces that act to counteract these obstacles. One is the increased industrialization that stands to provide employment opportunities and to draw labor from farms within the regions such as the Southeast. Increased industrial development at particular locations will encourage more rapid changes in the structure of agricultural production because labor can then move more freely between farm and factory, without being faced with uncertainties of distant employment contacts and living conditions relating to particular family customs.[8] A second force related to location and industrialization is the development of part-time farming, an activity supplementary to greater off-farm income and a shorter work week possible in a growing economy. Then too, increased *suburbanization* can be looked upon as a production trend for a growing economy. Land resources are increasingly being used for another product, *living in the country*. Agriculturists

[8] This is perhaps the important aspect of T. W. Schultz's location matrix in his *Economic Organization of Agriculture*, op. cit., chapters 9 and 10.

sometimes point to this development as a *bad* use of *good* land resources, since no physical product is forthcoming. Regardless of this physiocratic notion, there is as much "goodness" in using farm land to produce *residence products* as to produce *food products*, especially in a society with a reasonably equitable income distribution where many consumers may have ability to bid for both categories of product. In a growing economy, the income elasticity of demand for the residence product of land is probably much greater than the elasticity coefficients for food or fiber products of land. We should expect a growth in this product of "country land," particularly in regions of dense population and heavy industrialization. Since the supply of agricultural land is large relative to the demand for its food and fiber products in our current stage of economic growth, further suburbanization should be looked upon with favor as far as income of agriculture is concerned.[9]

Adjustments in output of other nonfood products from agriculture can be also expected with further economic growth. One of these products, tobacco, will not occasion any great adjustments among regions. The outcome for tobacco may well hinge on medical decisions of the future. However, aside from this uncertainty, total production should increase by a rate greater than that for total population. With a low positive income elasticity and some continued trend in smoking habits (both still aside from medical findings), increases in total demand can be met by currently adapted within regions without any marked change in the structure of the producing plant, technical skills or resource inputs. Any sizeable increase in tobacco would require more labor and capital particularly in the form of fertilizer. However, most of this labor is on hand in *adequate supply* for major tobacco localities and the capital would undoubtedly be available.

The magnitude by which production of major fiber crops should move upward or downward is subject to greater prediction error. The complex of economic growth will have a greater impact on these products than on food products or tobacco. This is particularly true for the important growth variable, technical innovation. The major innovation effect for food products takes place within agriculture whereas fibers are greatly affected by innovations from both inside and outside agriculture. Development of improved synthetic fiber substitutes is likely to continue and, at the very least, the direction of innovations encouraging substitution is not likely to be built around cotton to replace synthetic fibers. Prices do, of course, set limits on substitution. At some level of cotton prices, demand and production of this commodity should come into

[9] The main negative aspect of suburbanization is perhaps the lack of system and planning which results in community, school, taxation and public-service difficulties.

equilibrium with synthetic substitutes. Perhaps this equilibrium will come with a slight increase in cotton output; perhaps it will come with some small decrease. In any case, it would result in withdrawal of some resources from cotton in the Southeast. Resources would be freed for use in producing more of those industrial and farm products that characterize continued growth in an economy with high income and wealth levels. Innovations within agriculture promise to augment those from outside agriculture in causing shifts from cotton in the Southeast to products demanded more by consumers in a growing economy. Further improvements in varieties and mechanization, and perhaps further development of irrigation, promises to cause continued shifts to cotton in the West.

Wool is likely to fare no better than cotton. Both products are likely to be faced with a considerable decline in per capita consumption, with perhaps a slight increase in total consumption growing out of population increases. Wool, however, will draw few if any additional resources to it. Production will remain geared to current localities of specialization where climate and topography result in production possibilities favoring sheep.

Changes in Aggregate Structure

We have mentioned some of the differential adjustments among products and the regions that produce them. These differences are based on variations in the meshing of agricultural products with economic development. The aggregate agricultural product will be composed of relatively fewer services of land and labor and relatively more of capital and managerial services. Marginal rewards to labor in agriculture will lag behind those of nonfarm industries. Greatest depression of relative returns will be for those farm products and regions (a) that have lowest income elasticities of demand, (b) that are most threatened by development of technical substitutes in industry, (c) that have a low rate of technical innovation as compared with other agricultural regions, and (d) that have production possibilities giving a low substitution ratio or comparative advantage to alternative products. In these same regions, the marginal return to land services will be relatively depressed and will constitute a relatively smaller portion of the total value of product. Disparities in agricultural incomes growing out of economic growth will follow a similar regional pattern. Land supply for agricultural products in aggregate will continue to be relatively great. The relative importance of this resource in the national economy will decline, except where it is well adapted by location for nonfood and fiber uses. Farming will increase in degree of competition among firms with producing units that control the most managerial skills and capital inputs gaining most from techno-

logical advance. Production in the commercial segment of agriculture will continue to be oriented more to the market and less to the household.[10]

Given the current public investment in agricultural research, the production possibilities are likely to stretch to favor agricultural products physically as much as nonagricultural products. However, values and tastes of consumers in a growing economy will not allow the ratio of average value of output divided by physical unit of input to increase as much in agriculture as elsewhere. Still, a continued increase in the product output-labor input ratio of agriculture will allow agriculture to make its greatest contribution to economic progress (a) by freeing of resources to be used elsewhere, (b) by producing an important portion of the nations basic resource supplies, particularly labor, and (c) by safeguarding supplies of subsistence food products in case of contingencies such as war or unpredicted population growth.

Conditions

We have viewed possible or likely trends in agricultural production under a sustained period of growth for the U. S. economy. If appropriate fiscal and monetary policies are present and used when needed, this process might go unbroken and reflect great strength in a short period of time.[11] Even with the short-run effects of recessions, however, these general trends will still occur over a more extended time period. Other "controlled" variables could come into the picture. For example, widespread trade arrangements with relatively undeveloped countries where income elasticities for food are much higher than in the United States could place quite a different demand on agricultural resources. Products from farms would then be more nearly *industrial inputs* of economic growth, as they move through foreign markets in exchange for nonagricultural products. But under traditions and prospects, the main exchange of the United States is likely to be with nations already somewhat similar to ours in respect to starting point and rate of growth. In these channels of trade and stages of growth, agricultural exports will fit into a slot not greatly different from that mentioned previously.

Directions for Agricultural Economists

The prospective meshing of agricultural production with economic growth is important to the activities of agricultural economists. Along with the present capital and labor mobility problems in agricultural,

[10] For declines in the proportion of the farm product moving directly to households, see M. G. Reid, *Food for People*, New York: John Wiley and Sons, 1943, p. 73; and *Agricultural Statistics*, U. S. Dept. of Agr., 1950, table 683.

[11] Our statements also have supposed a national agricultural policy that does not prohibit adjustments of the kind mentioned.

economic growth is certain to depress incomes in some sectors relative to others.

Efforts need to be devoted to policies that redress losses to those economic sectors penalized that progress can go forward most rapidly for the economy as a whole. These policies need to facilitate shifts of resources among farm products and between farm products and other commodities, rather than to retard adjustment. They should safeguard against inequitable income distributions that may cause the welfare of some groups to decline extremely, even in the presence of general progress. Production economists need to develop longer-run analyses of needed adjustments in resource use and production, whether the products be those of farms or nonfarm sectors. Education needs to focus more on the long-run outlook, in order that transfers of resources will be facilitated and so that fewer farm persons will make wrong judgements in their early or flexible years. Marketing economists might well recognize that they are faced with the dilemma of a growing economy. The proportion of the consumers dollar that reaches the farmer's pocket must continually decline under economic growth. This is true because the income elasticity of demand for the services going into foods sold at retail is much greater than the elasticity coefficient for the food itself. Hence, marketing specialists may wish to tell legislators that they have attached an inconsistent assignment to the funds they have provided, and that the direction of research should be changed accordingly. Institutional economists may find that a major assignment exists in designing zoning and other laws for urbanization, to maintain order in community organization, tax structures and public services generally. Other relationships between economic growth and possible activities of economists could be mentioned. However, these are suggested by other papers on this program.

ADJUSTMENTS IN A GROWING ECONOMY–SOCIAL CONSIDERATIONS

ROBERT L. CLODIUS
University of Wisconsin

EACH generation of economists has its "new" economics. In the past 25 years there has developed the new economics of Joan Robinson and Edward Chamberlin which gave great impetus and direction to the study of imperfectly competitive market structures of all kinds. A bit later came the new economics of employment and national income determination to be called the Keynesian revolution. The revolution has now spent itself but it is unlikely that economists will ever be the same, so deep was its impact on their thinking. And in 1955 the new economics is upon the profession again. Now it is called the economics of growth and development. Almost any day soon I expect to see that Seymour Harris has edited yet another book on the current fancies of economists–this one to be called "Growth, the New Economics."

Appropriately growth economics might be called a revolution too, and one that has taken place in the past 10 years. It is commonplace in economics that propositions begin as follows: With a given level of aggregate income and with a given income distribution and with given consumer preferences and with given political, legal, and social institutions, and at a given instant of time, then . . . and so forth. This is economic statics. There is no growth here. The tradition of economics has been so strong in this direction that only recently have considerations of growth and progress taken their rightful place as co-equal with resource allocation-efficiency in the thinking of economists. The field is growing so rapidly that between volumes I (1948) and II (1952) of the American Economic Association's *A Survey of Contemporary Economics,* the editors saw fit to give the economics of growth its own chapter.[1] With this revolution in the significance attached to growth it is little wonder that economists scarcely batted an eye when President Eisenhower forecasted a national income of $500 billion before the year 1965. Similarly agricultural marketing economists accept as appropriate in 1955 a national marketing workshop with the theme of a growing economy. This program at the annual meeting of the American Farm Economic Association also attests to the general acceptance of growth as part of the new economics. As a result economics may fast be losing the label of the dismal science. Just like the typical high school graduation address, no matter which way you slice it, at the present time it always points onward and upward.

[1] Bernard F. Haley, *A Survey of Contemporary Economics,* vol. II. American Economic Association, Homewood, Illinois, 1952, Chapter 4. "Economics of Growth" by Moses Abramovitz.

Is there truly justification for abandoning the faith of our intellectual fathers regarding the dismalness of economics? Just two decades ago the bogey was economic maturity, which was a euphemism for stagnation. The prospects of a nongrowing economy were certainly dismal to most people. However the expectations of the stagnationists were not realized. The economy has been growing for the past 15 years, and is expected to continue. This does not imply that growth brings sweetness and light or that growth itself is automatic. The Malthusian spectre continues to haunt some people. Growth is a problem, and it creates problems. Some of them are pretty dismal.

Since this paper is concerned with both growth and social considerations, it will proceed to examine first the contributions that economic theory makes toward an understanding of growth, second the contributions of welfare economics in an understanding of growth problems, third the contributions and work of agricultural economists on growth, fourth an evaluation of these contributions, and fifth some ideas, as yet untested, that may prove useful in research on problems of growth and development.

On the Economics of Growth

At the outset there are problems of terminology in this area. It is not clear whether growth, development, and progress are synonyms, or whether they differ in meaning. There is a strong implication in the literature that these terms are used interchangeably. The generally accepted concept of growth, development, or progress involves increases in real output for the total economy measured in the aggregate or on a per capita or per worker basis.

Following traditional economic analysis, problems of growth must be analyzed both from the demand side and the supply side. Both are necessary. Adam Smith's famous thesis, as rehabilitated and elaborated by Allyn A. Young, emphasizes that economic progress comes from the division of labor, which is limited by the extent of the market and which is likewise limited by the general level of productivity, which in turn is dependent upon the division of labor.[2] This circle may be broken into at any point as a conceptual matter. On the demand side (extent) of the market for the total economy are the components of aggregate expenditures. They include consumption expenditures (C), private investment expenditures (I), and government expenditures (G). This is the familiar $Y = C + I + G$ formulation for the determination of the level of aggregate income. All of the issues concerning hot and cold

[2] Allyn A. Young, "Increasing Returns and Economic Progress," *The Economic Journal*, Dec. 1928.

Keynesians, un-Keynesians, and anti-Keynesians lie here on the demand side to bedevil students of growth economics.

On the supply or capacity-to-produce side are all the factors related to output. These include such things as natural resources, plant and equipment, manpower, its composition, skill and training, techniques of production, knowledge and its communication, geographical mobility, the attributes and attitudes of the people, social institutions as laws, the organization of production, political systems, and the like. A book or books could be written about the effect of each of these factors separately on aggregate output. Other volumes would be required to show their interaction with one another and the emergent patterns of growth. To date there have been only rather piecemeal attempts to analyze problems on the supply side.[3] The one exception to this is with respect to the factor capital and its handmaiden, technology. The accumulation of capital expands the resource base increasing the means to produce output. Advances in technology make the available capital go further in expanding output. Of all the factors lying on the supply side, why has capital been selected for special consideration? Here economists are like the drunk who was looking for his lost keys under the street light not because he lost them there but because he thought he could see what he was doing.

There are at least two probable explanations for this. There is the inclination on the part of economists to avoid factors that they consider "noneconomic." The habits and attitudes of people, the pattern of culture, the political system, and legal matters are variously assigned to the psychologist, the sociologist, the anthropologist, the political scientist, the student of law and so on. Since these factors are usually considered as "given" within the framework of economic analysis, the economist works with those variables whose magnitudes are easily observed to be changing. This introduces the second reason for working with capital and technology in problems of growth. The possibilities of measurement are perhaps greater than with some of the "noneconomic" ones. Research people are certainly to be sympathized with if not excused for selecting variables with the greatest likelihood of successful measurement. This is not to say that no problems of measurement exist, however, where capital is chosen.[4]

This brief sketch of growth economics serves to indicate that there is

[3] Some useful views are to be found in the papers given at three general sessions and appearing in the *American Economic Review*, May 1951. The general sessions were entitled "Modern Industrialism and Human Values," "Factors in Modern Industrial Development," and "Economic Progress: General Considerations."

[4] As an example see Simon Kuznets, "Proportion of Capital Formation to National Product," *American Economic Review*, May 1952, No. 2.

as yet no received doctrine. It appears there are still more areas of issue than of agreement. The elements of a growth economics that emerge stem primarily from capital theory. One of the recurring questions is growth for what? Presumably economists are interested in studying growth for the contributions that might be made in the field of public and private policy. Almost immediately considerations of welfare are interjected. Although growth has implications for social welfare the two subjects are not the same as the following paragraphs will indicate.

On the Economics of Social Welfare

The literature on welfare economics reflects the fact that many innovations have occurred here in recent years also.[5] This reflects a long period of convalescence following the blow landed by Lionel Robbins in 1932. He argued that economics could not be an objective science until the measurability of utility was rejected, interpersonal utility comparisons were abandoned, and economists ceased making recommendations on policy involving shifts in welfare among groups. At this stage for many classicists welfare economics became illegitimate and was disowned. However, this bit of intellectualism was reared by the writers on socialism for many years after having been cast out of the house.[6] Here, indeed, is an example of the benevolence of the socialists in caring for the unfortunate! The "new" welfare economics has arisen in two instances out of trying to find a marriage license to establish the legitimacy of the offspring even if only to show that marriage might have taken place on the eve of accouchement.

One approach came from Pareto. It has been added to by Kaldor and Hicks. A social optimum is defined as a situation where no one can be made better off without making someone else worse off. Interpersonal utility comparisons are avoided because no one can get ahead at another's expense using this criterion. It further admits of the possibility of compensations. The person who is about to lose as society moves toward the social optimum may be compensated so that he is no worse off while everyone else is doing better.

Conceiving of the social optimum as a mixiumum has permitted the establishment of the necessary marginal conditions to define the maximum. As developed by Reder there are seven marginal conditions for a

---

[5] This section relies heavily on Kenneth Boulding, "Welfare Economics" in Haley, *op. cit.* and Tibor Scitovsky, "The State of Welfare Economics," *American Economic Review*, June 1951.

[6] As late as 1948 in *A Survey of Contemporary Economics*, H. S. Ellis, editor, Philadelphia, the economics of welfare was contained in the chapter "Socialist Economics" by Abram Bergson!

welfare maximum.[7] Since these are not independent they might be more or less in number. This part of the new welfare economics seems to have special significance for problems of production. If it is possible through more efficient organization of production to have more output without leaving anyone worse off, social welfare has been enhanced by this criterion. In short, any improvement in efficiency is an improvement in welfare as defined.

The second approach involves the concept of a "welfare function."[8] This function relates the welfare of each individual to the components of his own well being and to his judgment of the distribution of welfare at large. When aggregated, individual welfare functions become the social welfare function. Matters of distribution and equity are automatically introduced and become part of the functions. The problem for economists becomes one of determining welfare functions and of specifying the maximum.

There are important qualifications that must be made with respect to the new welfare economics. There is general agreement among welfare economists that the strongest part of welfare economics lies in the specification of the optimum methods of producing a given basket of goods. Sometimes the economist can recommend on efficiency considerations alone. However, in democratic, free enterprise economies "all economic policies must be appraised by their effects on efficiency and equity simultaneously; and no recommendations can be made on the basis of one of these criteria alone."[9] Or as Boulding put it: "The preoccupation of welfare economics with the definition of a single optimum may well have done a disservice insofar as it has diverted attention from the critical problems of developmental economics."[10] The principle of compensation also must be qualified. First there is the question of the origin of the money for the necessary compensating payment. Then there is the question as to whether or not the "optimum conditions mean anything in the absence of full compensation."[11] This begs the final question of determining the magnitude of the "full" compensation.

Problems exist also with respect to the concept of the social welfare function. The determination of the aggregate function involves the relative weights that individuals attach to their preferences. How is the weighting to be done and who is going to do it? Also enough work has

[7] Melvin Reder, *Studies in the Theory of Welfare Economics*, New York, 1947, Chapter II.

[8] Associated with the name of Abram Bergson, "A Reformulation of Certain Aspects of Welfare Economics," *Quarterly Journal of Economics*, Feb. 1938.

[9] Scitovsky, *op. cit.*, p. 310.

[10] Boulding, *op. cit.*, p. 27.

[11] *Idem*, p. 25.

been done by Arrow and others to indicate there are serious restrictions to be imposed before a social welfare function is meaningful.[12]

In short welfare economics is in a very sad shape. As Reder has expressed it, "But positively, welfare economics has been of little help; the attempt to take into account all factors that affect economic welfare has made both the Bergsonian welfare function and the Kaldor-Hicks compensation principle virtually devoid of specific policy implications."[13] However he sees some hope in developing welfare criteria on an *ad hoc* basis arising out of concrete problems. Two further statements may be quoted with approval.

Bronfenbrenner has called welfare economics with its great expectations for leading economists out of the wilderness of policy "the twentieth century's most persistent false alarm." He adds, that he "is among those who feel that the importance of *efficiency* in allocating resources as a criterion for judging an economy on welfare grounds is generally less than the importance of *equity* in the distribution of assets and incomes, or the importance of *smoothness* and *rapidity* in adjusting to changes in taste, populations, and resources. The stress on the efficiency criterion in conventional welfare economics practically belies the name."[14]

Scitovsky, writing in a similar vein, says, "One definite conclusion that has emerged from the welfare controversy is that while in some cases and in some communities the economist can make policy recommendations on efficiency grounds alone, in our society he cannot usually do so but must take into account also considerations of distribution and equity."[15]

From this I conclude that the economist concerned with problems of a growing economy will find little assistance and solace from the present state of the economics of social welfare. However, the concept of social welfare is meaningful and useful to economists if they think of it in terms of what people want from the economic system. Conducting research and making judgments about welfare in these terms should prove to be important for the economics of growth.

On the Contributions of Agricultural Economists

Growth is not a word frequently used by agricultural economists to designate their interests. The literature does contain many references to "progress" and "development," however. In the areas of marketing and

[12] Kenneth Arrow, *Social Choice and Individual Values*, Cowles Commission Monograph No. 12. New York, 1951.

[13] Melvin Reder, "Comment" in Haley, *op. cit.* p. 35.

[14] Martin Bronfenbrenner, "Contemporary Economics Resurveyed," *Journal of Political Economy*, April 1953, p. 163.

[15] Scitovsky, *op. cit.*, pp. 314-315.

farm management the phrase "technological progress" seems to have won out over other possible expressions of growth. A corollary expression frequently used is "increased efficiency."

Although increased efficiency has been a shibboleth in marketing and farm management for years, it was not until the principles of production economics became widely understood in recent years that efficiency became more meaningful. It gave both of these areas a needed shot in the arm. Marketing received a further injection with the Research and Marketing Act of 1946.

In marketing at least one attempt was made to appraise prospective research according to economic welfare criteria.[16] Using the narrow efficiency criterion coupled with the principle of compensation, it concluded that greater marketing efficiency was consistent with welfare as defined. In addition to analyzing costs, resource use and efficiency, marketing research under RMA has included new and expanded uses and new and expanded markets for products. This is implicit recognition that growth depends not only on use of resources but also the extent of the market in the tradition of Adam Smith and Allyn Young.

Most of the writings in farm management seem to be limited to the capacity or supply side of growth only. An example of this is an article by Heady in which he appraises the basic economic and welfare aspects of farm technological advance.[17] Implicit here is the notion that increased efficiency in agriculture (growth) worsens the income position of farmers. Welfare using the efficiency criterion can be enhanced if farmers are compensated. He seems willing to settle for less than full scale compensation, however, hence some doubt remains on theoretical grounds that welfare even in the narrow efficiency definition has been enhanced.[18] A similar article that uses *ad hoc* welfare criteria is by Sherman Johnson.[19] Both of them carry statements of belief or declaration of what the policy goals of farm management should be.[20]

Outside of farm management and marketing the words "development" and "progress" seem to be in vogue. In land economics there is a long tradition of interest in the man-resources ratio in problem areas and what can be done about it. Public interest and public money for area and river basin development, conservation, and water use development have spurred considerable effort by land economists. The relationship between

---

[16] O. H. Brownlee, "Marketing Research and Welfare Economics," *Journal of Farm Economics*, Feb. 1948.

[17] Earl O. Heady, "Basic Economic and Welfare Aspects of Farm Technological Advance," *Journal of Farm Economics*, May 1949.

[18] See the quotation stated earlier, footnote 12.

[19] "Technological Changes and the Future of Rural Life," *Journal of Farm Economics*, May 1950.

[20] Heady, *op. cit.*, p. 314. Johnson, *op. cit.*, pp. 234-235.

land use (land reform) and development has also carried the land economist into the four corners of the world to learn, to consult, and to contribute to the growing understanding of the problems of growth. There is a mushrooming literature on economic and agricultural development in this, that, and the other country.[21] The problem of development of the Southeastern United States has received considerable attention as well as that of some parts of the West.[22]

With some exceptions agricultural economists have not dealt directly with the theoretical ideas underlying their studies of growth and development. For several years T. W. Schultz has been offering various hypotheses about growth and development. His definition is "Economic development consists of an increase in aggregate income with changes in per capita income unspecified, except that no community becomes worse off."[23] Economic development is here cast within a welfare framework and immediately gets into trouble. As Heady concludes elsewhere, only by the principle of compensation can it be considered that "no community becomes worse off."[24] Development without compensation does not contribute to welfare in this interpretation.

Like the people in farm management, Schultz appears to approach development mostly from the supply or capacity side but he does recognize the market. On supply he does not restrict himself to physical resources and technology alone, but adds economic organization. These are fundamental. In passing Schultz does consider the importance of political and social processes, however. The second strategic factor in economic development—namely, the extent of the market, is given the classical treatment. That is to say, the extent of the market is seemingly taken as given. It is defined according to various structural attributes which are the parameters of demand for the products of agriculture. These structural attributes on the demand side are combined with structural and locational attributes on the capacity side to produce the explanation for economic development. Policy conclusions follow from these established attributes.

Another attempt to add insights into economic development was made by Long.[25] For him development means more resources, new technology

[21] See articles in the *Journal of Farm Economics*, May 1948; Aug. 1948; Aug. 1949; May 1951; Nov. 1952; Nov. 1953; and May 1954, for examples.

[22] The South received considerable attention in the *Journal of Farm Economics*, Proceedings Number, Nov. 1952. The West received its turn in the Proceedings Number of the *Journal of Farm Economics*, Dec. 1953.

[23] T. W. Schultz, *The Economic Organization of Agriculture*, New York; McGraw-Hill, 1953, p. 160. This definition appeared originally in "Reflections on Poverty Within Agriculture," *Journal of Political Economy*, Feb. 1950.

[24] *Economics of Agricultural Production and Resource Use*, New York: Prentice-Hall Inc., 1952, p. 826.

[25] Erven Long, "Some Theoretical Issues in Economic Development," *Journal of Farm Economics*, Dec. 1952.

which has the effect of more resources, and a distribution of income to increase social welfare. This formulation of development considers only the capacity side. It is welfare oriented, but it ignores discussing the fundamental issues in the economics of welfare. He emphasizes what every sophomore student in economics must learn—that traditional long run theory takes all factors as variable. For him, economic development to be meaningful must be long run. At this point Mr. Long and Mr. Schultz might engage in dialectic. To Mr. Long, the fixity of "structural and locational attributes" applied to supply and demand factors sounds out of place in a long run developmental setting. To Mr. Schultz, a framework of development that ignores the extent of the market is likewise in error. Both gentlemen appear to be correct.

Some Doubts About Growth, Development, and Progress

This general session is concerned with *Adjustment Problems in a Growing Economy*. What is a growing economy? Aggregate and per capita income are growing in the United States. So is total population. There is also a growing number of old people. The economy is growing in terms of responsibility for social security. Interest in music and the high fidelity reproduction of music is growing. Juvenile delinquency is a growing problem, together with the growing urbanization of the population. Automotive horsepower is also on the increase.

For most people a growing economy connotes progress. Yet progress implies moving toward some known goal or objective. Here is the rub. As Williamson says, "Goals are determined by philosophical and ethical considerations and in the final analysis are based upon group or individual preferences. There is no appeal beyond the point of the statement of such preferences. No one can prove by an appeal to logic the superiority of one preference over another."[26] Particularly this points up the danger of taking any goal or goals as "assumed" or as "given." Work with nations having different cultures from the United States emphasizes this point.

Here it seems desirable to resurrect a neutral word like "change" or "dynamic" to describe the field. Even this may not be helpful in analyzing problems of adjustment. Presumably problems of adjustment are analyzed so that solutions may be forthcoming. These solutions carry implications that knowledge of the desirable directions of change are known (knowable), or given for the economy. The latter is inadmissible on intellectual grounds except in a dictatorship. With interpersonal utility comparisons invalid it is doubtful that social preferences at the economy level can

[26] Harold Williamson, "An Appraisal of American Economic Progress," *American Economic Review*, May 1950, p. 107.

become known from aggregating individual preferences.[27]

These doubts that concern me obviously do not bother some economists and agricultural economists. Using the cloak of assumptions they hide under assumed goals or objectives with respect to output, income, security, freedom, and the like. Someone once said that assumptions were definitions in disguise. Perhaps this is how the goals of policy come to be defined.

A person not having these doubts could present an impressive list of adjustment problems in a growing economy. They could be classified and discussed as to whether they were on the market or on the capacity side of the developmental identity. Knowing what the goal or objective was in each case, the believer could indicate the direction of adjustment that was desirable by definition. Social welfare, if defined appropriately, could be declared to be moving in the direction of a maximum. The situation would be comparable to that of the Wisconsin legislature which passed a resolution two years ago declaring that the state budget was balanced even though expenditures continued to exceed current receipts. Their logic was unassailable because something had to be done to stop the rumor that the budget was not balanced.

On the Positive Side

To speak of growth in any kind of an economy implies the availability of alternatives. Without the freedom and ability to adjust to change no growth can take place. There are total economies and regions within economies where no growth or development is occurring. By and large these are areas where few alternatives are available or, if available, cannot be realized. On the other hand growing economies are characterized by the availability of alternatives and their realization. Adjustment problems in a growing economy appear to boil down to this matter of alternatives. The question of who does what, with which, and to whom, as a result of growth is dependent upon the availability of alternative who's, what's, which's, and to whom's.

Long was half right in emphasizing resources in development. Resources are important. They provide alternatives. Expanding resources mean expanding alternative ways and means of production to choose among, to produce alternative levels and alternative compositions of output. But why limit expanding alternatives to only half of the developmental structure—the supply side? Development depends also on the extent of the market. In many cases this is the limiting factor. Expanding the alternatives with respect to habits, customs, institutions, tastes, desires, informa-

[27] Kenneth Arrow, "A Difficulty in the Concept of Social Welfare," *Journal of Political Economy*, Aug. 1950.

tion, and spendable income provides the pull effect for development to take place. What Duesenberry calls the "demonstration effect" would be an example on the market side.[28]

One of the greatest problems in growth is balance. In the first instance balance must be maintained with respect to both supply factors and market factors. To stimulate supply and to achieve large increases in output for which the market has no prospect of being extended is not long run economic development. Similarly, to whet, to stimulate, and to extend aggregate demand and tastes for products for which no supply is forthcoming, is not long run economic development. The second aspect of balance involves promoting expansion of alternatives for growth among all groups within the economy. Social considerations would favor the development of no second class citizens left in the backwash of change as the economy on the average went steaming by. The social scientist must be concerned with the composition of the aggregate as well as the growth of the aggregate *per se*.

None of the above implies knowing what the ultimate social welfare is. It does suggest that the individuals who make up a society are free—that they may choose and that they can act on their choice. Furthermore their choices are unrestricted with respect to subject matter. Choices might involve efficiency, equity, mobility, smoothness, stability, degree of regulation, organization, and so forth.

Economists as social scientists will want to introduce at least one constraint in the development and elaboration of alternatives as a means for providing adjustment to economic change. That is, alternatives must fit into the framework of what the social scientist conceives to be the interests of society as a whole based on a judgment of the will of all the people. To do otherwise would be to accept the doctrine that what is good for General Motors is good for the economy as a whole. Agricultural economists should be dedicated to the idea that what is good for the economy as a whole is good for agriculture.

A few examples may illustrate that development is synonymous with alternatives and that a theory of development is basically a theory of alternatives. Wisconsin was once a major wheat state. Then wheat went west. Wisconsin did not stagnate because dairying was an alternative. Northern Wisconsin, Minnesota, and Michigan were great lumber areas at one time. When the lumber was cut, economic stagnation set in because there were no alternatives. In recent years recreation was created

[28] Americans travelling all over the world have demonstrated that material well being could be enhanced. See Ragnar Nurkse, "Some International Aspects of the Problem of Economic Development," *American Economic Review*, May 1952.

as an alternative on the supply side together with a market of considerable extent. The cut-over regions are again developing.

Monopoly derives its strength and power from the fact that substitutes (alternatives) for whatever is being monopolized are remote. The public interest is one of creating alternatives to the public's having to sit passively and take what the monoply is dishing out. One alternative action is public regulation as in public utilities. Another is the encouragement of competitors. A third is the development of countervailing forces. A conventional welfare theorist using the efficiency criterion may boggle at the latter but enough has been said previously to indicate that while efficiency is something in welfare, it isn't everything.[20]

The dead hand of depression falls so heavily upon the land because market alternatives are dried up. A government price support program comes as a blessing because it provides an alternative market for the farmer for example. Increased disposable income of farmers contributes to aggregate demand, and alternatives for the total economy are expanded as well as for farmers.

Another example might be the economic development of agriculture. At the present time growth of supply factors has produced an output that exceeds the extent of the market. Expanding alternatives on the market side in terms of new tastes, new desires, changed attitudes, higher incomes, subsidized consumption and the like, would be appropriate if development would continue. If expanding the extent of the market is impossible in the long run, then alternatives must be created on the supply side involving the release of resources to other markets that are expanding. However, if the expanded market will be there in the long run though not in the short, alternatives may be considered on the supply side that permit use of fewer resources in the short run. A case could be built here for the use of production controls in the short run.

These examples are not definitive. They are meant to be suggestive of the proposition that growth and adjustment to growth can come about only as people avail themselves of the alternatives that exist or can be created.

One final part that this engine of growth requires is a self-starter. On the supply side it is called the "innovator," or commonly the entrepreneur. This is half the picture again. Such persons are required also on the market

[20] A theoretical argument has been presented by Martin Bronfenbrenner to the effect that monopoly is the appropriate way to combat monopsony. "The Economics of Collective Bargaining," *Quarterly Journal of Economics*, Vol. 53 (1938-39), pp. 535-561. Scitovsky also represents that a more equal distribution of the benefits of trade may occur under bilateral monopoly than under one-sided monopoly or oligopoly. Tibor Scitovsky, *Welfare and Competition*, Chicago, 1951, pp. 415-416.

side. From the viewpoint of both production and consumption they might still be called innovators. Surely the people who purchased and rode in horseless carriages were no less innovators than the producer. The same might be said of the first consumers of olives, martinis, oysters, and TV dinners.

The literature of our Western civilization is full of the role and the importance of the innovator. Economic historians find in him a dominant factor to explain the development of capitalism and the economic growth associated with it.[30] They too emphasize that the alternatives seized upon by the capitalist were not given but were in fact created. It was in this manner that economies grew. In our time the chapter of the Kaplan's of grape juice fame in the United States and the Duttweiler's of *Migros* in Europe as innovators in the development of marketing is still to be written.

Summary

The following five points summarize the paper: (1) The circle of economic growth and development requires consideration of both capacity and market factors together. (2) The present state of the economic theory of welfare does not recommend itself to policy matters involving growth and development. (3) Social welfare considerations in growth might still be handled by permitting the will of the people to express itself through their free choices among alternatives and by ensuring that a sufficient number and variety of alternatives are available to all. (4) Basing long run economic growth and development on the matter of alternatives requires that *everything* on the market and supply parts of the circle be viewed as changing or subject to change. From this consideration alternatives can be determined or created. (5) The innovator—consumer, producer, or public official—is required to spark the process of growth.

As a conclusion to this paper you may be interested to hear my own reactions toward it. The contents are general; the conclusions are tentative. It is more a statement of theory than discussion of the adjustments agriculture will be facing in the decades ahead. It is more nearly social theory than straight economic theory. However, all this is appropriate because a broad framework establishes something to hang the pieces on, and economic growth by necessity is interdisciplinary in nature. Putting it all together you can answer for yourself whether or not economics has ceased being dismal.

---

[30] Besides Schumpeter's writings, a statement by Werner Sombart, "Capitalism," *Encyclopaedia of the Social Sciences*, New York, 1930, is extremely interesting.

LOW-INCOME PROBLEMS IN A HIGH-EMPLOYMENT ECONOMY

KARL A. FOX*
Iowa State College

AT THE outset, I should like to view low-income problems very broadly as the resultant of a social process. Individuals are, I believe, born with different innate capacities, some of which may be associated with the ability to earn income in our kind of society. More important and less speculative are the differences in personality and motivation that are impressed upon young children in the home. Some of these differences are associated with the economic and educational levels of the parents and the neighborhood. The public schools act as an equalizing influence in trying to impart a common body of knowledge that contributes, among other things, to economic productivity.

As a result of these various factors, our new entrants to the labor force each year have varying degrees of initial earning power. On an absolute basis, these differences within a particular age group or "cohort" tend to increase as time goes by. Some of the early advantages of personality and education seem to have a cumulative effect on earning power over the years. In addition, ill health and disabling accidents bring sudden losses in income status, and death or desertion of the principal breadwinner confronts some families with economic distress. Finally, old age puts a terminus to regular employment, although not necessarily to adequate consumption levels.

For the purposes of this paper. I want to draw a sharp distinction between low-income problems associated with old age, total disability, and broken homes, and those that afflict able-bodied workers. The first type of low-income problem can be alleviated only by means of transfer payments from those members of society who are currently producing income. Such payments increase the well being of the recipients but not their productivity.[1] The low-income problems of the able bodied may be alleviated by increasing their "built-in" productivity through education and training or their "effective" productivity through establishing them in

---

* The author takes full personal responsibility for the views expressed in this paper. Gladys K. Bowles of the Division of Agricultural Economics, U. S. Department of Agriculture, was most helpful in suggesting sources and providing data. Martha N. Condee and Viola E. Culbertson of the same division supervised the statistical computations that underlie some portions of the text.

[1] Aid to broken families doubtless helps to insure the future productivity of the children involved. Social insurance is rapidly modifying the dependence of the aged upon current transfer payments, and is also reducing the incidence of low incomes among this group.

more favorable environments or resource combinations. The rest of my paper will be concerned only with the able-bodied groups.

An income distribution confined to able-bodied workers would still give us a "lowest 10 percent." It would not necessarily give us a significant number of people living under substandard conditions. Nor would it necessarily be advantageous to society to devise special programs for assisting the lowest 10 percent rather than to rely on programs of the same total cost that would slightly increase the productivity of all income groups.

Suppose we look at the process of education and acculturation provided by a community from the standpoint of statistical quality control. At any given time the institutions of the community, in conjunction with the innate abilities of the children born into it, tend to produce a certain average level of performance on the part of labor force entrants and a certain degree of variability about the average. I could conceive of a community being perfectly satisfied with the outcome of this process and feeling no concern over the fact that a small but stable percentage of able-bodied workers earned less than a stated income. I could also imagine this community analyzing alternative ways of increasing its productivity and concluding that emphasis should be placed on still more education for those who were already on the way to above-average education and income. The limitations of the lower paid workers *might* prove relatively expensive to overcome.

The dispersion of incomes among workers of a given age group in such a community would arise from factors that the community was unable or unwilling to control. In either case it would be hard to justify special programs to raise the productivity of every worker earning less than a stated minimum. Given free mobility of labor and a competitive organization of the community's economic life, each worker would tend to receive his marginal value product and the allocation of resources within the community should approach an optimum consistent with its institutions.

Let me hasten to say that I do not propose to identify the low-income problem (or rather the lack of it) in this hypothetical community with the real problems that exist in the United States. But I believe it may help us to diagnose some of these real problems more clearly.

The United States is not yet like the single community of our illustration. The national labor force has emerged from many different local processes of education and personality formation. Although one community may be satisfied with the product of its own institutions, other communities may be quite dissatisfied with the educational level of migrants coming from it. The increased mobility of our civilian population

and the necessity of pooling our manpower for military service during and after World War II have heightened our awareness of these differences and have led many of us to believe that geographical concentrations of low incomes (relative to the national average) are causes for national concern.

Various forces, cultural and economic, are now tending to make the United States more like a single community. National magazines, comics, movies, and radio and television programs are constantly eroding local differences and lowering the psychological barriers to migration. The cost of transportation (relative to hourly earnings) has probably declined, and the habit of travel has certainly increased. In fact, the mobility of our population has increased to such an extent that it may soon be appropriate to apply to the nation as a whole the other economic norm of a single community—namely, the approximate equating of marginal labor productivities.

If geographical concentrations of low income are to be eliminated, geographical differentials in education must also be eliminated. For any given age group, Census data show a strong positive association between education and income. As of 1949, the median yearly income of male workers in the North and West (ages 35 to 44) ranged from $2,079 for those with no formal education to $3,554 for those who had completed high school. The average increase was more than $120 per year of school completed, a handsome return on the community's investment of $200 or so in providing that year of schooling. The income-education gradient for males in the South was even steeper, but hidden correlations among education, color, and rural-urban residence probably affected this result.

Geographical differences in education have gradually narrowed over the years. For males in the North and West aged 20 to 21 years, the median number of years of school completed was almost constant from about 1938 to 1950 at 12.1 or 12.2. During the same period the average in the South rose from 9.5 to 10.5 for all males and from 6.5 to 7.8 years for nonwhite males. The ratio of median school years completed by Southern nonwhite males to those completed by all males in the North and West appears to have increased from a little more than 50 percent in 1930 to about 65 percent in 1950.

Racial discrimination has been a major factor in the maintenance of geographical concentrations of low income. It is not easy to separate the effects of discrimination from these of other factors, unless one is to ascribe all differences in remuneration between whites and nonwhites to discrimination. In the North and West as of 1949, limiting the comparison to males who had completed high school, the ratio of median incomes of nonwhites to those of all males was 86 percent for the age

group 22-24, 76 percent for ages 30-34, and 66 percent for ages 55-64. In the South, the corresponding figures were 60, 60 and 50. Rough calculations suggest that the median incomes of whites with equal amounts of schooling are about the same in the South as in the North and West; those of nonwhites in the South averaged only about 70 percent of those of nonwhites in the North and West. (Differences between rural-urban residence may exaggerate the true regional differences for nonwhites of comparable education.)

Looking to the future, then, two of the prerequisites for breaking up concentrations of low income are improved education and the reduction of discrimination. Equality of educational facilities and instruction should be attainable in most areas within a reasonably short time. However, the effects of different home and neighborhood standards cannot be erased quickly. Past discrimination and low educational achievement on the part of the parents will be visited noticeably upon the children for at least another generation. Nevertheless, given equality of education and equality of economic opportunity, a high-employment economy should lead to a rather rapid redistribution of young workers among occupations and regions and to a reduction of regional income differentials.

The simple, obvious and human things that can be done to clear up pockets of rural poverty must be done in the local communities. But the over-all success of these efforts will be conditioned to a major extent by the performance of the general economy with respect to short-run stability and long-run rates of growth. High employment facilitates the movement of workers among occupations and areas. An examination of the consequences, or accompaniments, of high employment during the past decade and a half gives us much reason for optimism in this regard.

One indication is provided by the great reduction in inequality of incomes (per capita) among states. When differences are expressed as percentages of the U. S. average, the variability of incomes among states was only 66 percent as large in 1953 as in 1940. A simple regression analysis gives a figure of 64 percent for the relative inequality of incomes in 1953.[2]

The above measures relates to farm and nonfarm incomes combined. We do not have comparable net farm income estimates by states for 1940 and recent years. The nearest available measure is provided by Margaret Hagood's indexes of farm operators levels of living for 1940 and 1954. These indexes for 46 states show only 58 percent as much variation (relative to the 46-state average) in 1954 as in 1940. A measure of "elasticity" at the means, allowing for an apparent curvilinearity in the relationship, yields about 52 percent with a standard error of 2 percent. The correspondence among these indexes and net farm income is not close enough,

[2] The standard error of this coefficient is 0.029.

however, to support a conclusion that the disparity in farm incomes has been reduced more than that in total incomes since 1940.

Differential migration from farms has been a major leveling factor since 1940. When the states are stratified into 6 groups on the basis of farm operator levels of living in 1940, we find a perfect rank correlation between these levels of living and net migration from farms during the 1940-50 decade. (Net migration is expressed as a percentage of the 1940 farm population in each state.) The group of states with the highest farm levels of living showed a net migration rate of 14 percent. The group with lowest levels of living showed a net migration rate of 36 percent.

This relationship suggests a very hopeful outlook. Actually, the picture is clouded by the fact that population pressure was closely correlated both with levels of living and with net migration. The states with highest farm levels of living in 1940 had about 126 young males ready to enter the labor force during 1940-50 for every 100 older males expected to leave the labor force; the states with lowest levels of living had 197 prospective labor force entrants per 100 putative retirees.

Because of the intercorrelation between farm labor force pressure and levels of living, an attempt to separate these two influences by means of multiple regression analysis is of dubious value. The two net regression coefficients based on data for 46 states are barely significant. However, the coefficient of multiple determination reflecting their joint influence is highly significant ($R^2 = .497$). A somewhat different formulation indicated that net migration from farms tended to change in direct proportion to farm labor force pressure and, in addition, tended to increase moderately if the gap between farm levels of living and nonfarm incomes in the same and adjoining states was large.

Since the patterns of causation seem complex, it may be sufficient to note that net migration from farms increased more than proportionately to increases in farm labor force pressure (about 1.3 percent to 1). Thus, the final effect of the processes associated with a decade of high employment would be expected to reduce interstate differences in farm income on a per-worker basis.[3]

[3] Other combinations of factors were used in exploratory regression analyses. One of these was the increase in manufacturing employment, 1940 to 1950, relative to the 1940 farm labor force (both factors taken for the same state and for the two adjoining states with highest median nonfarm incomes). This factor suggests that local industrialization has provided relatively little relief for the labor force pressure on Southern farms. The direct pull of industrial expansion has been relatively much greater in tne North and West.

For the most part, the regression analyses were unsatisfactory from the standpoint of "structural" interpretation. They yielded descriptive statements that are already well-known; the South has relatively low levels of farm living and of nonfarm income, and it has high rural birth rates and small magnitudes of industrial expansion relative to its large farm labor force. More careful studies might nevertheless yield analytical statements of considerable value.

Much of the net migration from farms during 1940-50 consisted of young people who came of working age during the decade, (i.e., boys and girls who were 10 to 19 years old in 1940). In fact, the net migration from farms of young people in this age group was equivalent to more than 50 percent of the number living on farms as of 1940. The migration percentage for those aged 20 to 24 at the beginning of the decade was substantially lower, and the migration rates for those aged 25 to 29 was only a fraction of the rate for the 10 to 19 year old group.

This rapid and extensive redistribution of young workers between farm and nonfarm employment is what one would expect in a high-employment economy, particularly one in which educational differentials are narrowing and discrimination is being reduced. If the labor market for workers under 30 were wholly independent of that for older workers we might expect a very rapid dwindling of regional income differentials within the younger group. Actually, income levels are influenced by the total labor supply, and the large migration of young workers has had much more moderate effects on the distribution of the labor force as a whole.

The age-selective pattern of migration has other causes and consequences. Census data indicate that the median income of workers of each educational level tends to rise until the ages of 45 to 54. Much of this increase no doubt reflects the channelization of effort along particular career lines and the development of specialized skills. The young farm migrant today is likely to have roughly the same abilities and general knowledge as the young city worker, but many of the skills acquired by older farmers are not transferable to nonfarm jobs. If these older farmers leave the farm they are at a disadvantage relative to experienced city workers, and the lower average quality of their basic education puts them at a disadvantage relative to many of the younger city workers. It is easy to see why farm operators over 30 are reluctant to leave their farms.

The age-selectivity of migration also affects the average educational levels and other age-associated characteristics at both sources and destinations of population movement. These effects must be borne in mind in future attempts to explain interstate and farm-nonfarm differentials in income per worker.[4] Between 1940 and 1950, the percentage of the total farm population aged 15 to 29 shrank from 26.3 to 21.2; the percentage from 30 to 64 increased from 35.5 to 38.1 percent; and those under 15 or over 65 rose from 38.2 to 40.8 percent.

Estimates of net migration from farms for the nation as a whole during

[4] Comparisons of income per capita introduce still another factor, namely the ratio of dependents to workers. At best our economic institutions are calculated to equalize incomes per worker; they cannot be expected to equalize per capita incomes among communities with different "dependency ratios."

1950-54 suggest that the equalizing processes of the 1940's are still continuing. Net civilian migration from farms during 1950-54 has averaged almost as high as in 1940-45 and somewhat higher than the average for the 1940-50 decade. Since the farm population base in 1950 was about 18 percent smaller than in 1940, it appears that the rate of adjustment of people to resources in agriculture was relatively greater in 1950-54 than in 1940-45. The geographical pattern is broadly similar; a comparison of percentage changes in farm population (not net migration) in the 9 Census divisions, 1950-54 with 1940-50, shows a rank correlation coefficient of 0.90.

The basic mobility of both farm and nonfarm populations continues relatively high. Between April 1953 and April 1954 about 8 percent of male civilians between the ages of 20 and 29 changed their state of residence. The rate for males between 30 and 64 was about 2.6 percent. Roughly similar percentages changed their county of residence within a given state. During a period of 10 years, workers now 20 years of age would average about 80 changes in state of residence per 100 workers. The male labor force as a whole would average nearly 40 such changes per 100 workers. If all of these movements took place along economic gradients favorable to the reduction of inequalities, our economy should approach "final equilibrium" among the states and regions within a decade. Even if half or two-thirds of these movements were offsetting, due to personal or family happenstances of random geographical incidence, the contribution toward equalization of incomes among regions would be extremely large. By 1965 the variability of incomes among states might be 40 percent or less of the 1940 level. Inequalities in the incomes of farm residents might shrink at least as rapidly.

Concluding remarks. Geographical differentials in education have been narrowing and the economic force of discrimination appears to have been diminishing in recent years. These factors point toward a fairly rapid reduction of regional differences in the quality of new entrants into the labor force. However, the average levels of skill and education among *all* workers resident in low income areas will not improve so rapidly, and selective out-migration of the very young will raise age-distribution problems whose effects will last for many years.

The special programs recommended for low-income areas—education and training of young people for nonfarm as well as farm occupations and the improvement of credit and advisory services for those who wish to continue farming—are clearly in the right direction. These programs are bound to increase the productivity of farm people who are now disadvantaged. But the rate at which pockets of rural poverty are cleared up will depend to a large extent upon our success in maintaining high employment and vigorous growth in the economy as a whole.

DISCUSSION: ADJUSTMENTS IN PRODUCTION TO A GROWING ECONOMY

H. B. JAMES
North Carolina State College

Professor Heady predicts continued and rather rapid growth in the national economy, but concedes that short-run depressions may occur that would cause temporary set backs. Along with these predictions he assumes that the "economic rules of the game" will be such as to permit resource allocation to take place in accordance with the competitive model. His statements on adjustments in agricultural production flow from his predictions regarding the national economy, his assumptions regarding the functioning of the competitive model, and his statements on income elasticities at the present stage of economic development in the United States.

My point of view is such that I find it difficult to disagree with his basic logic or the general tone of his paper. Therefore, I shall point out a few minor inconsistencies and indicate a few points that might have received greater emphasis.

In talking about population and food supply he indicates the challenge is one of producing more agricultural products with fewer resources so as to release resources for growth in the nonfarm sector. This is quite acceptable as a general statement, but the greatest challenge may lie on the other side of the fence. The real challenge may be the ability of the nonfarm sector to expand sufficiently to make full use of its resources and to absorb the resources released by agriculture. Historically, our economic system has not automatically distributed income in such a manner as to keep demand high enough to employ all of our resources efficiently. Even now considerable investment is necessary. At times in the past investment has not expanded rapidly enough to employ efficiently the resources available to the nonfarm sector. The real challenge for economic growth may well be the ability of the nonfarm sector to absorb additional resources from agriculture, instead of agriculture's ability to release them.

On the other hand, if the demand for resources in the nonfarm sector is great, we will have considerable "economic pressure" on agriculture to increase its efficiency. If the rate of technological development and change in agricultural production is less than the increase in demand for labor in the nonfarm sectors, over-all economic growth will be restricted.

Heady's predicted adjustments in agricultural production rest heavily on his interpretation of the income elasticity of demand for various products. His analysis appears to overlook one point that might alter his predictions slightly. The fact is that the income elasticity of demand for some of the commodities that he considers as negative may be expected to approach zero as income continues to increase. For example, French fried potatoes may well become complimentary to steaks.

There would appear to be a slight inconsistency between his arguments for part-time farming and his statement that incomes are low in the Southeast because of small farms.

Policy does not receive much consideration as a factor influencing resource use.

In his analysis, Schultz assigned an important weight to differential urban and farm birth rates. Heady makes no mention of this.

The effects of geographic location of population on market structure and on location of production are dealt with but not fully developed.

In his advice to economists he overlooks the role that students of policy might play in promoting efficiency.

Technology of production seems to carry much more weight in his forecast than technology of utilization, although the latter is recognized.

DISCUSSION: ADJUSTMENTS IN A GROWING ECONOMY—SOCIAL CONSIDERATIONS

G. A. PETERSON
Federal Reserve Bank of Kansas City

Professor Clodius' paper has left me with two basic impressions: (1) He is in general agreement with other economists on the state of welfare economics. (2) He believes that some attempts to study economic growth have invariably fallen into the dilemmas of welfare theories. All of us will agree with him on the first reaction that the state of welfare economics is not satisfactory. On the second, we may not be so unanimous. The central theme of Professor Clodius' paper is in the direction of reviewing the literature and evaluating the tools available to economists in making analyses of problems existing in a growing economy. I wish to confine my remarks to this same general theme.

Economic progress is of current interest to economists. An increasing gross national product on the supply side and an increasing disposable income on the demand side are probably reasons for this current interest. It also appears that this interest will be with us for some time. Whether the economy is in a state of growth, stagnation, or decline, the role of the economist remains the same. The problems may be different but the economic tools that apply remain basically unchanged.

The review of contributions in the field of welfare economics reminds us of our graduate study days, particularly the warnings against making value judgements and specifying distributions of income. As is often the case with discussions of welfare theory, it is difficult to determine just which parts of the theory are acceptable and which parts are rejected. It is quite clear that Professor Clodius finds little assistance and solace from economics of social welfare in dealing with problems of a growing economy. At just what point in his discussion this conviction becomes evident is not clear. He states that efficiency is a part of welfare theory but not everything. The inability to determine personal or social preferences that would indicate desirable directions of change seems to be the part that becomes inadmissible. He later rejects the notion that goals can be taken as "given."

What concerns me is how one can even make any analysis on the basis of efficiency criteria without knowing whether to use price ratios or an indifference surface. Reder states in the paragraph following Professor Clodius' quote: "But the wreck of formal welfare theory has not and ought not to prevent economists from making specific policy recommendations. Such recommendations are the subject matter of welfare economics, and the development of a set of

axioms from which these various recommendations can be deduced is merely an instrument for facilitating the rendering of still further recommendations."[1] This may be the reason agricultural economists are quick to make analyses on the basis of the acceptable portions of the theory. Injections of compensation are made only when it affords direction of policy rather than conclusions regarding the exact state of social welfare.

Professor Clodius devotes some discussion to the study of economic growth from the supply side (production) and the market (demand). Certainly both are a part of economic growth and should be considered simultaneously. He expresses concern over the treatment of one side of the economy while taking the other side as "given." The economic system is indeed complex. Failures in this area are not always due to the short sightedness of investigators. Problems must often be delineated into segments of the economy to make the empirical procedures manageable. The number of variables affecting the economic system is very large. Which should be included and which should be excluded generally falls to the ingenuity of the investigator. He may have *a priori* reasons for excluding them or may exclude them on the basis of tests of statistical significance.

It would be inappropriate to deal with the subject of adjustments in a growing economy without recognizing the contributions in the field of econometrics. I believe we can look to the econometrician for help in dealing with some of the problems that have been pointed out by Professor Clodius. Those (such as Tyszynski) who have advocated a reconsideration of welfare economics and considered the role of economic theory in policy decisions place considerable hope and admiration in the development of econometric methods.[2] Those of special significance to the study of adjustments in a growing economy are mathematical models of linear programming, input-output analysis, and sequence analysis. Econometric models provide useful information about certain structural relations of the economic system. Although they have not always been as reliable as we would like in predicting economic adjustments with changes in structural relations, they are worthy of our attention and may be more promising with further development.

In conclusion, Professor Clodius puts forth the notion that the theory of growth is a theory of alternatives and a balance of alternatives on the supply side and the market side. These alternatives must be "created" on both sides. Does this mean that we must have a one-to-one correspondence between alternatives on the supply side and the market side? Even if this condition exists, is it not possible that some choice criteria must be introduced because of limited resources either on the side of supply or demand? Is this not a problem of choice from among many alternatives to maximize some "given" social or economic goal? It seems that we are back to efficiency criteria unless economists are to create the desirable alternatives. If they do, they must necessarily engage in value judgments.

We are grateful to Professor Clodius for stimulating our thoughts in this direction, but as he suggests, I should leave the final conclusions to you.

---

[1] M. W. Reder, "Comment," in B. F. Haley, Ed. *A Survey of Contemporary Economics*, Irwin 1952, p. 35.

[2] H. Tyszynski, "Economic Theory as a Guide to Policy: Some Suggestions for Re-appraisal," *Economic Journal*, Vol. LXV, June 1955, pp. 195-215.

DISCUSSION: LOW-INCOME PROBLEMS IN A HIGH-EMPLOYMENT ECONOMY

FRANKLIN J. REISS
University of Illinois

Dr. Fox has presented an encouraging affirmation of the effectiveness of various facets of the low-income farm program embodied in the Department of Agriculture report on the "Development of Agriculture's Human Resources." Since I find myself in substantial agreement with his position I shall in part supplement his statements and otherwise direct attention to some policy issues that may arise from a vigorous pursuit of the action program suggested by the Secretary's report.

To provide a background for our thinking we should, perhaps, attempt a brief look at some reasons for such a program. At the very heart of the program appears to be the long-held American tradition of equal access to economic opportunity, the ideal that grants everyone within the limits of his capabilities the same chance to find employment in the occupation he chooses, to rise as far in it as his abilities will take him, and to receive a reward comparable with his productivity. Embodied in this ideal are value judgments that may lie outside the economist's field of inquiry, but they and their concomitants and consequences may well explain our willingness to accept the income transfers inherent in publicly financed programs to assist low-income farm areas in solving their economic problems.

The proposed program also has many objectives included in the Employment Act of 1946, although I did not find a direct reference to that effect. Certainly fuller employment, greater resource productivity and a more equitable income distribution are objectives common to both. At any rate the Secretary's plea for "an interdepartmental coordinating committee" is appropriate in view of the great importance of off-farm employment and other nonagricultural activity to the success of this program. As an operating policy, such coordination appears to be necessary and sound.

I am in complete agreement with Dr. Fox's emphasis upon education as a major remedial device in solving the low-income farm problem. Being well informed, and being equipped with sufficient evaluative and analytical tools and skills are necessary attributes of the individual to enable him to effectively employ his freedom to choose. The Secretary's report emphasizes this freedom with this statement in its summary and recommendation, ". . . whatever is done must be done within the American philosophy that each individual make his own decisions and set his own goals." Another requirement, of course, to make individual choice meaningful is that there must be reasonable alternatives from which one may choose. If the only alternative to subsistence farming perceived by the individual is unemployment, poverty and discrimination, he will choose subsistence farming. But is it a meaningful choice?

Further education can open new vistas to those whose goals, as Dr. Fox has pointed out so well, are largely inherited from a retarded culture. Before any new goal can be come a stimulus toward economic activity the individual must experience not only an awareness of a need or desire to go in a new direction, but also an awareness of possible and probable means of satisfying this need or desire. In other words, rational decisions must be based upon reasonable ex-

pectations concerning the consequences of contemplated action; hence the need for effective programs to provide real alternatives and the need for communicating knowledge of them to these people.

There are some policy questions and many problems between a simple recommendation of more formal education for people in low-income areas, and an effective implementation of such a recommendation. Formal education has been a responsibility of state and local governments and private institutions. Federal aid is likely to mean at least a measure of federal control. How far do we want to travel in the direction of federal control over an activity from which our young people derive many of their ideals, attitudes and allegiances? My concern is on behalf of the pupils and teachers in elementary and secondary schools who are probably much less able to defend their academic freedoms than are land grant college personnel.

Another policy question on a more atomistic level concerns the kind and extent of vocational training and guidance to be incorporated in an expanded educational program for low-income areas. Certainly we need to provide training in agriculture to develop the greater managerial competence required on larger scale farm units and marginal land resources, but it is desirable, as is now true in certain localities, to give this training to three or four boys for every one of them who becomes a farm operator?

Numerous studies of recent origin contribute conclusive evidence of the fact that the number of young men seeking entrepreneurships in agriculture is substantially in excess of the number of opportunities becoming available. My estimate for Illinois is that not more than 40% of the boys now growing up on farms will find an opportunity to become farm operators. T. W. Schultz, D. Gale Johnson *et al.* have pointed out the need for substantial off-farm migration from low-income areas. There is a growing awareness among educators in the agricultural field of the need for a better selection of a smaller number of young people to receive training for vocations in farming and in rural leadership. The task of providing adequate and objective guidance for high school students (or for elementary pupils) in making curriculum selections that recognize individual differences in innate ability and in economic opportunity, is beyond what may be reasonably expected of the average high school vocational instructor. Specialized counseling personnel, better testing programs, and a greater awareness of the problem by vocational teacher trainers can be effective measures.

Education may be a slow process for accomplishing desired social changes, but it is a means that probably enjoys the greatest public acceptance. It preserves or enhances the individual's freedom and ability to choose; it encourages off-farm migration by opening doors to urban employment opportunities for farm-reared boys; it increases the individual's potential competence in either farm or nonfarm activities; and it facilitates the social adjustment of those who migrate to urban areas. The last two are important in making the shift out of farming successful and satisfying. There is little net social accomplishment in merely shifting slums from a rural to an urban location. Nor is there any net accomplishment in the return of migrants to their rural origins following an unsuccessful experience in town. Several studies have indicated the difficulty such migrants face in adjusting to an urban way of life and in meeting the job competition of urban workers who are better trained and better educated. The urban communities who are to receive the off-farm migrants have a real stake

in the general health and educational levels these people bring with them.

I shall mention two additional policy questions that grow out of the proposed enlargement of Farmers' Home Administration activities in low-income areas. One of these concerns the lending policies of Farmers' Home Administration; the other concerns the concept of the family farm as an instrument of agricultural policy. Omitting for the moment any question of loans to part-time farmers, my first concern is that the Farmers' Home Administration maintain its present policy of extending credit only to those eligible applicants who can best employ it in the organization and operation of farm units large enough to permit efficient operation and to support an adequate level of living for the operator and his family. Financing full-time farm operators on smaller units than this may serve only to delay needed adjustments and to perpetuate subsistence farming in the low-income areas.

It would be helpful to know what individuals would be served by F.H.A. loans under an expanded program who are now not being served. For example, at the end of the 1952-53 fiscal year, the State Director of the Illinois F.H.A. made available to us copies of all unserved applications for operating loans that had been filed in that year, together with the district supervisor's answers to the question of why, in each case, a loan had not been granted. Out of 591 applicants who did not get loans, 19 percent were denied loans primarily because their proposed farm operations were deemed to be too small, inadequate or too hazardous. A contributing reason cited in approximately a third of these cases was an apparent lack of managerial competence on the part of the applicant. A second group, comprising 16 percent of the applicants, failed to get loans because available funds were exhausted. Fifteen percent of the applicants were not given loans because they were unable to find farms. Eleven percent were in debt too deep already with little prospect of being able to use additional capital efficiently. Ten percent were able to get credit elsewhere. Nine percent were deemed to be lacking in managerial ability, and the remaining 20 percent either were not eligible for loans, or were not granted loans for miscellaneous reasons that parallel those already given.

Obviously those who were otherwise eligible but who failed to get loans because funds were not available would be the most likely candidates for loans from additional funds. But what does the picture look like outside of Illinois in states more completely involved in the low-income farm problem? My plea is that the selection of clients and the bases for extending credit and managerial assistance continue to be such as to achieve a sufficient improvement in the scale of farming operations and in the technology employed on these units that the changes will survive beyond the period of external support and tend to be perpetuated.

My final question concerns the implications for family farm policy in the proposal to authorize F.H.A. to finance part-time farmers, and in the recommendation to include the needs of part-time farmers in county extension programs. Part-time farmers are not a homogeneous economic group. One can readily distinguish at least six different types on the basis of their operations and the motives that led them into part-time farming: (1) those who are farming part-time, usually on a small acreage, as a prelude to retirement from urban employment; (2) those who are primarily interested in living in the country or who wish to rear their children in the country while they continue in full-time urban employment; (3) those who, because of managerial deficiencies, are

unable to earn an adequate income from farming and turn to urban employment as a supplementary source of income; (4) those with seasonal off-farm employment who seek to supplement inadequate incomes from such employment; (5) those who are seeking establishment in full-time farming and who engage in off-farm employment only until they can obtain sufficient operating capital and/or a farm large enough to permit them to devote full-time to farming; and (6) those who live in areas where the land resources are not amenable to the organization of family farm units. Of these types, the last three seem to be the only ones that merit encouragement and assistance from public credit and extension education programs. In my opinion they *are* acceptable alternatives to family type farms under the conditions given. The difficulty lies in drawing the necessary distinction in the administration of the proposed assistance programs. What about the family that buys a home in the country, including 60 acres of land, less than half of which is tillable? The father, a semi-skilled laborer, continues to work full-time in town. The farm was purchased on contract with only a small down payment. Its isolated location and small irregular fields make it unattractive to field renters, and unless the owner has any livestock, the pasture land and farm buildings will remain unutilized. Two boys in high school and the father, in his free time, could furnish all the labor needed. Shall F.H.A. finance the purchase of some farm machinery and a small beef-cow herd?

If you are inclined to go along with that one, as I would, suppose we alter only one condition, that this farm is not quite so isolated from other units that can and would take on additional acreage. The most desirable arrangement for the family involved might still be the part-time operation, but from the standpoint of encouraging family type farms, should such a loan be made? Or should the land be incorporated in a neighboring operation and the boys be helped to find part-time employment away from home? To what extent should short-run, subjective family goals be given priority over the longer-run objective of greater production efficiency in agriculture? Or perhaps the question really is: given a range of socially desirable goals, is the family farm a universally superior type of agricultural firm?

In conclusion I wish to state my agreement with Dr. Fox when he pointed out that even an optimum economy will have its "lowest ten percent" and that the limitations of these workers may be either too expensive to overcome or that doing so would not be consistent with the value judgments of the society that embraces them. Between that hypothetical situation and the real one in the United States is a difference that appears to justify a measure of public assistance to restore and to maintain a greater equality of economic opportunity, consistent with the need for adequate rewards, to secure the services of our most productive individuals. That a program with these objectives should require some changes in public policies is inherent in its inception.

PROGRESS AND PROBLEMS IN DECISION MAKING STUDIES

(With Reference to the North Central Farm Management Research Committee's Interstate Managerial Study)

Chairman: A. W. Epp, University of Nebraska

THE NATURE OF THE STUDY

HARALD R. JENSEN
University of Kentucky

THE theme of this session is "Progress and Problems in Decision Making Studies" with specific reference to the North Central Farm Management Research Committee's Interstate Managerial Study. My assignment is to discuss the nature of this study. To perform this task, I shall (1) outline some general characteristics of the study, (2) sketch the problem to which we as researchers addressed ourselves, (3) give you a functional classification of the survey questions,and (4) present a few features on general procedure.

General Characteristics of the Study

First, the study is interstate. Cooperating are agricultural economists from the Indiana, Iowa, Kansas, Kentucky, Michigan, North Dakota and Ohio experiment stations. Second, it is an interdisciplinary study. Members of the Sociology Department, Michigan State University, contributed greatly to the formative and methodological phases of the study, while members of the Iowa State College Statistical Laboratory formulated the sample design. Third, the study is of considerable magnitude. Enumerators obtained answers to 66 questions and collected approximately 1,100 schedules. Hence, an extensive pool of data is available for numerous state and regional studies. Finally, the study is an empirical one dealing with the managerial or decision making process in farming.

An empirical study of this kind orginated out of a dual situation. On the one hand, we observed that an important segment of our economic theory and applied work in farm management had neglected the managerial or decision making process. On the other hand, we recognized a growing body of managerial concepts and models of relatively recent development. This dual situation underlies the problem that was formulated for empirical study.

Statement of the Problem

Recently developed managerial concepts suggest:

1. That the relative emphasis the land grant system now places on

price, production, innovational, institutional and human relationship problems may differ from the relative emphasis that farmers place on these problems.

2. That the land grant system, especially farm management research and teaching—both resident and extension—probably neglects the managerial process. The most neglected phases appear to be:
   (a) The management functions of observing, analyzing, deciding, taking action, and accepting responsibilities for action.
   (b) The knowledge situations (inactive, learning, forced action, subjective risk and subjective certainty) in which managers find themselves, together with the cost of acquiring knowledge and its value.
   (c) The analytical methods (deductive and/or inductive) used by managers in making decisions.
   (d) The strategies employed by managers in putting decisions into action such as maintaining cash and feed reserves, establishing flexibility and developing patterns of behavior for dealing with people.
   (e) The personal nature of the inputs and outputs of the managerial process.
   (f) The values attached by managers to dollar income, security, stability, chances of gains and protection against risks.

Looking at the problem in this way suggested (1) the need for us to know more and to understand better the values, such as security, flexibility, stability and long chance taking, that guide farm families, and (2) the need for us to know more about the ways managers think and carry through the managerial process or perform the five managerial functions. Such knowledge and understanding appear fundamental to the kind of teaching and research that will yield a maximum of farm family goals from a given input of management and other resources. With this objective in mind, survey questions were designed that can be classified functionally as follows:

Functional Classification of Survey Questions

Questions on information

Five information categories: (1) price structures and changes, (2) production methods and responses, (3) prospective technological developments, (4) behavior and capacities of people associated with farm businesses, and (5) economic, political and social situations in which a farm business operates have been outlined by Johnson, Haver and others.[1] To

[1] See G. L. Johnson, and C. B. Haver, *Decision-Making Principles in Farm Management*, Kentucky Agricultural Experiment Station Bulletin 593, January 1953, p. 8.

determine the usefulness or lack of usefulness of these categories, farmers were asked to enumerate the types and kinds of information they considered important in organizing and in operating their farms. To determine the relative usefulness farmers place on the five information categories, farmers were asked to rank the categories in order of importance. As a basis for improving channels of communication, farmers were asked to indicate how and where they got different types of information. Examples of how they got various types of information are past experience, experimentation on a limited scale, reasoning from information known to be true, and written records. Examples of where they got different types of information are newspapers, radio, demonstrations and experiment station publications.

Analytical problems and processes in the management function

Understanding the management function requires an appreciation of the analytical problems associated with it and of the analytical processes that describe it. Hence, in this functional class some questions were constructed to determine the extent to which farmers actually feel a need for information on how to perform the five managerial functions. Others were framed to determine whether or not farmers compare costs with returns (subjectively and objectively) of probable actions on a problem. Some questions served to yield descriptive information for use in testing the hypothesis that deductive thinking is analytically important in the managerial process. Still others were devised to establish the relative concern of farmers for Types I and II (Neyman-Pearson) sense errors, i.e., the relative concern about taking action when they should not have and of not taking action when they should have. Lastly, this functional class also contained some open ended questions for gaining additional insights into the decision making process. These open ended questions are phrased to discover models used by farmers in deciding on what and how much to produce when prices of factor inputs and product outputs change.

Expectation models

This functional group of questions deals with expectation models for product and factor prices, people, institutions and technology. Considerable progress has already been made in evaluating the relative efficiency of various price expectation models, particularly for product prices. Much less is known about expectation models used by farmers for factor prices, people, government action and technological change. Consequently, this group of questions sought description. Open ended questions, together with probing techniques, were used in the hope that appropriate models can be established from insights obtained and that some models actually used can be determined from information gained.

Strategies

This group of questions deals with insurance and personal strategies. One interest here is to determine the extent to which a selected list of insurance practices (formal and informal) is employed by farmers. Another interest is to ascertain whether or not farmers use certain personal strategies in handling people associated with a farm business. Indicated use of personal strategies will be determined indirectly through answers on whether or not certain strategies were considered appropriate in a prescribed situation.

Knowledge situations

Replies to questions in this grouping furnish a basis for further evaluation of the five knowledge situations as classified by Johnson and Haver.[2] The ability of farmers to give meaningful examples of each of the five situations serves to indicate the extent to which farmers recognize the corresponding situations in their own experience.

Propensities to buy insurance and to take risks as related to the disutility of losses and utility of gains in income and assets

The objectives underlying this group of questions are to ascertain (1) how the insurance a farmer would buy depends on size of loss insured against, premium paid and chances of loss, and (2) how the chances a farmer would take depend on size of possible gain, costs and chances of gain. This information, in turn, is to be used (1) in testing various insurance and chance-taking hypotheses and (2) in estimating particular points on individual utility functions for income and assets. Data obtained from this group of questions will be related to the Friedman-Savage hypothesis on utility of choices involving risk.

Controls

The last functional group of questions are the control questions. These questions deal with the conditioning factors of tenure status, size and type of farm, contacts with extension services and farm organizations, education, vocational training, farm experience, nonfarm employment, family responsibilities, employer status, income, assets, liabilities and net worth. Answers to these questions are expected to be useful in testing hypotheses concerning the position of the manager with respect to these factors and his managerial processes.

Procedure

The idea of making an empirical study on the decision making process

[2] *Ibid.* p. 11.

in farming originated with the Risk and Uncertainty Subcommittee of the North Central Farm Management Research Committee. The services of this subcommittee and of the Farm Foundation were used to establish the cooperative relations among the participants from the various states. Michigan State University arranged for and contributed the services of survey experts for use (1) in constructing and pretesting the survey schedule and (2) in training interviewers at an Interviewers Training School held at Purdue in June of 1954. Michigan State has also assumed primary responsibility for coding, punching, sorting and tabulating the results. As previously mentioned, the Statistical Laboratory at Iowa State College designed the sample.

Concluding Remarks

By outlining some general characteristics of the study, by delineating the problem under study, by giving you a functional breakdown of the survey questions and by indicating a few points on procedure, I hope to have given you a general understanding of the nature of the study.

Our efforts are based on the conviction that our understanding of managerial processes can be improved through research and that better understanding, in turn, will result in more fruitful research, resident and extension teaching involving farmers and their families.

THE UNIVERSE OF FARMS STUDIED

CECIL B. HAVER[1]
University of Chicago

THE idea of an empirical study of "decision making" by the farm firm was conceived in the initial long run plans of the risk subcommittee of the North Central Farm Management Research Committee. The first part of the research program was the development and organization of the body of theory and generalizations relevant to decision-making in farm management. A manuscript covering this phase was published in 1952.[2] With this first phase completed plans were initiated for the empirical verification of those hypotheses that, in the "decision-making" bulletin, had been supported largely by examples. The case for reorganizing and reemphasizing lines of agricultural research and extension required the testing of these hypotheses concerning managerial processes.

At the state level a number of case studies were initiated and have since been completed.[3] On the regional level plans were laid for an interstate managerial study.

A desirable procedure that was not feasible in the interstate study would have been to draw a sample that was representative of the 14 North Central states. But talents, interests and state needs resulted in settling on a probability sample that was representative with respect to the following: (1) the geographic areas delimited within each state, (2) the entire geographic area delimited within seven states, (3) the population of farmers having primarily entrepreneurial authority over business units producing more than $2,500 worth of farm products. This includes the value of home consumption but excludes the rental value of farm dwellings. Farmers with certain types of leases and most types of partnerships were excluded. Specifically commercial farms having livestock share leases, tobacco share croppers and two or more family partnerships were excluded. Cash and crop sharing rental arrangements and partnerships where all partners eat at the same table, and the respondent exercises dominant control, were included.

The sampling design and the drawing of the sample were undertaken by the Statistical Laboratory at Iowa State College. A stratified random sample of area sampling units was decided upon as being the most ap-

[1] Formerly, North Dakota Agricultural College.

[2] Glenn L. Johnson and Cecil B. Haver, *Decision-Making Principles in Farm Management*, Kentucky Agricultural Experiment Station Bulletin 593.

[3] Cecil B. Haver, *Economic Aspects of Hog Production in North Dakota*, North Dakota Experiment Station Bulletin 391, June 1954. Glenn L. Johnson, *Managerial Concepts for Agriculturalists*, Kentucky Agrilultural Experiment Station, Bulletin 619, July 1954.

propriate sample design. The seven states cooperating (Kansas, North Dakota, Iowa, Indiana, Michigan, Ohio, Kentucky), each indicated the area or areas in which their samples were to be drawn and the number of schedules they had time and money to obtain. Each state area was classified as a stratum except that Michigan had two strata. The eight strata were divided into area sampling units in which the expected number of eligible farms was two (three in Kentucky). The use of such sample unit sizes in terms of expected number of eligible farms was based on considerations of cost and ease of field operations. It will be noted that the sampling rate varied among strata, from 3/5 of 1% in Iowa to 8% in one of the Michigan strata (see Table 1). The study's needs and objectives prevailed over the statisticians desire for equal sampling rates.

The actual sample was drawn with the aid of 1950 Census of Agriculture and 1947 Revised Master Sample materials.[4] The basic strata and sampling characteristics are presented in Table 1.

TABLE 1. SAMPLING CHARACTERISTICS, INTERSTATE MANAGERIAL SURVEY, 1954

State	Stratum Number	Estimated Number of Eligible Farms	Average No. of Estimated Eligible Farms per Sampling Unit	No. of Sampling Units in Sample	Expected No. of Interviews to Be Taken	Sampling Rate	Actual No. of Interviews Taken
Kentucky	1.	1,790	3	50	150	1/ 11.9	121
Ohio	2.	23,599	2	100	200	1/118.0	137
Indiana	3.	15,769	2	100	200	1/ 78.8	187
Michigan	4.	37,545	2	112	224	1/150.2	202
Michigan	5.	394	2	15	30	1/ 13.1	30
North Dakota	6.	9,301	2	75	150	1/ 62.0	129
Iowa	7.	23,649	2	70	140	1/168.9	118
Kansas	8.	6,262	2	103	206	1/ 30.4	148
	TOTAL	118,309	xx	625	1,300	xx	1,072

This sample should yield unbiased estimates for parameters of the population specified, although certain kinds of biases may have entered

[4] The specific mechanics of the sample draw were as follows: The number of eligible farms for each whole or part county was obtained by taking the 1950 number of commercial farms with gross incomes of $2,500 or more, subtracting from this the 1950 number of livestock share leases and finally reducing this number by 20 per cent in order to adjust for partnerships, father-son arrangements, and changes in the number of farms since 1950. This 20 per cent was derived through judgment and experience. (This estimate proved to be low in all states and it now appears that 30 per cent would have been a more accurate figure.) After having determined the total number of eligible farmers per county, the total number of area sample units in that county was determined. The master sample materials were then used in subdividing the county into area sampling units of the desired size. Then a random sample of the desired number of area segments was drawn from each stratum.

into the study because of (1) questionnaire construction, (2) failure of the enumerator to properly identify each observational unit, (3) enumeration in a manner that elicits biased responses, (4) handling, editing and summarization of the data.

To guard against such sources of bias the group adopted several precautions. The questionnaire was developed after more than a year of effort and consultation on the part of about ten people. Every effort was made to avoid "loaded" or "leading" questions. Questions that might have been misunderstood were prefaced by an explanation. Some supplementary material was provided on cards. The schedule was pretested. To avoid "respondent fatigue" an originally long schedule was shortened into six schedules that required one and a half hours of interview time. All respondents were asked a group of control questions. Also all respondents were asked that group of questions that would be necessary to complete an individual state analysis. The other questions that were to be handled on a seven-state summary were rotated on every sixth schedule. An applicability sheet was constructed to be used in each sample segment to aid the enumerator in establishing the eligibility of sample segment residents. A strict "three" callback, no substitution rule was used. Finally the coding, editing and analysis are under the scrutiny of representatives from seven states. However in defining single household managerial units as we did, we may have selected certain "risk preference" groups. In Iowa, for example, livestock share lease tenants were excluded from the sample while cash and crop share tenants were included. The logic for this sampling decision was that livestock share tenants presumably make more joint decisions because of their contract. Actually this group of farmers may be a group that prefers to undertake fewer "risks" than do cash or crop share tenants. Thus the study universe may be biased in favor of people who prefer to assume greater "risks."

Another problem developed as field work progressed that had not been adequately anticipated. Who is the manager and who makes the decisions in these so-called single household managerial units when the respondent happens to be a married man? We become very much aware of the fact that the managerial process involves the whole family, or the whole "spending" unit. This study like so many farm management studies underemphasized a combination of a farm and a household. An extension of this study is now in progress wherein a subsample of the earlier respondents is to provide information on this area of decision making.

SOME PROBLEMS OF METHOD IN THE INTERSTATE MANAGERIAL SURVEY*

JOEL SMITH
Department of Sociology and Anthropology
Michigan State University

THIS paper is the report of a committee member whose role has thus far been defined largely as that of a consultant on problems of method. It should be made clear from the outset that the range of such problems encountered in the interstate managerial study has been circumscribed by two important decisions arrived at, for the most part, prior to the participation of this writer in the work of the committtee. The decisions concern (a) the delimitation of subjects with which the study would be concerned, and (b) the selection of the sample survey as the methodology to be employed in the collection of relevant data.

These remarks should not be interpreted as an indication of dissatisfaction with these decisions. Instead, they are intended to clarify a number of points. Firstly, the problems of method that have arisen in the course of the study are comparatively limited in number as a result of these early decisions, and not because our superior wisdom enabled us to anticipate and solve many problems before they caused difficulty. Secondly, this report should not create the impression that all the problems of method that may arise in the course of a study of the decision making processes of farm managers can be anticipated and resolved. Finally, this is a report on problems of method, rather than on methodologies, because the methodological problem was resolved by the early decision to use the sample survey approach.

The employment of the sample survey for data collection did not, of course, prevent the occurrence of a variety of problems of method. On the contrary, it is impossible to discuss, or even to mention, all that we faced in a report of this length. Therefore, this discussion will be limited to a consideration of those problems concerning which procedural suggestions based on our experience can be offered.

The execution of the typical sample survey involves a progression through a number of operations arranged in a relatively orderly time sequence. Some problems arising at three of these stages—the formulation of interview schedules to be used as instruments for the orderly collection of data, the actual collection of the data, and the systematizing of the collected data for analysis—will be the major topic of discussion.

---

* Journal Paper No. 1802 of the Michigan Agricultural Experiment Station, East Lansing, Michigan, Project No. 442. The writer would like to thank Glenn Johnson and Simon Yasin for their very helpful critical suggestions.

Formulating Interview Schedules as Instruments for Data Collection

The committee planned to investigate many facets of the decision making process, and accordingly the interview schedule was rather long. In addition, the complicated character of many of these factors contributed to a lengthy schedule. Although it is true that social scientists are now employing longer interview schedules, despite the old belief that formal personal interviews of more than a half or three-quarters of an hour create respondent fatigue and thereby lessen the reliability of responses, our pretests indicated that the tentative interview schedule was too long and unlikely to produce more than a few complete and reliable interviews. In order to meet this problem, it was decided that those questions that were either very time consuming or very difficult for the respondent to understand and answer should be rotated from interview to interview so that no respondent would have to answer all of them. Ultimately, six different forms of the interview were devised to be used in fixed rotation.

This solution was possible because the proposed sample was large enough to yield enough answers for analysis even if questions were asked of only one-sixth of the respondents. Of course, before the asking rates and the combinations of the rotated questions could be set, the study design had to be developed well enough to permit the anticipation of both the fineness of categorization and the cross-tabulation combinations that would be necessary to the analysis. In addition, the anticipated frequency of certain types of responses that were important to the analysis were considered in setting the rates at which questions would be asked. Although question rotation may avoid excessive schedule length, it can only be applied intelligently when theory and study design are so well-developed that most of the analysis can be anticipated. Moreover, question rotation may impose severe limitations on the data whenever the results of analysis indicate the desirability of pursuing unanticipated *post factum* analyses. Although we feel that we have minimized the risk of impairing *post factum* analyses, we do not yet know the extent to which we have penalized ourselves by rotating important questions.

The formulation of the interview schedule also raised a problem of communication. Some of the questions involved difficult concepts such as induction and deduction, budgeting from totals and marginal analysis, and summarizing concepts for types of information used in decision making. It was necessary for the respondent to understand clearly the meanings covered by such terms before he could give meaningful answers to questions concerning them. In order to maximize the respondents' chances of understanding these concepts, illustrative examples and simplified explanations were developed and sharpened on the basis of pretest interview experience. A number of schedule items involving these con-

cepts consisted of complicated sequences of questions. Therefore, it was decided to place the definitions and illustrations on 5″ × 8″ cards which a respondent could hold and examine during a relevant set of questions in order to prevent any distortion of his answer by progressively increasing misunderstanding of the meaning of a term as his comments were probed. The application of this technique for solving problems of stable understanding is limited to questions concerning concepts with direct and known empirical referents that are misunderstood or unknown largely because of the respondent's unfamiliarity with technical terminology. When questions are meant to ascertain the extent to which respondents are familiar with a concept, or to determine the distribution of the variety of meanings that respondents give to a concept, this technique should not be used.

Collecting Data by Personal Interview

The data for this study were collected in interviews conducted by more than twenty professionally trained agricultural economists working in seven participating states. Although the interviewers differed considerably in the extent of their formal training in agricultural economics, only a few of them had any formal training as interviewers. Thus, interviewers had to be trained and supervised to insure the collection of the maximum amount of desired data. An interview schedule, no matter how well designed or tested, will not succeed if interviewers do not handle it properly. The data are more than satisfactory but still are not all that they might be. Our experience emphasizes the importance of the process of training and supervising interviewers.

A tight time schedule and a limited budget restricted us to a one week period for training interviewers. Although the plan was to have all of the interviewers attend the training school, some states were unable to meet this goal. In such cases it was necessary to rely on the state's interviewers who were present to instruct absent interviewers in the use of the schedule. This procedure was partially successful.

Despite incomplete attendance at the school, the ratio of interviewers to trainer was too high to permit as much training as might have been desired. In view of the pressure on the instructor, it was necessary to consider an interviewer adequately trained when he had completed one interview without a major weakness and when he claimed to understand what his weaknesses were.

A uniform quality of interviews was to be maintained by supervising the interviewers as they worked in the field. This was to be accomplished by continuous reviews of batches of ten to twelve interviews sent from the states to the supervisor as soon as they were completed. These were to be reviewed by the supervisor as rapidly as possible and returned to

the states with his comments. Thus, it was hoped that errors would be caught before they affected many schedules. Our difficulties with this procedure suggest that it will only succeed when the supervisor has no other demands on his time and when there is a steady flow of schedules to his office. We only managed to approximate these conditions and we doubt that they can be attained perfectly. In addition, the supervisor often could not tell the source of interviewing difficulties from an examination of either the interviews or the accompanying letters (when these were available). Although some difficulties often seemed to derive from the attitude of an interviewer, this diagnosis could not be verified and remedial measures could not be taken without personal contact. Except in the case of the supervisor's own state, personal contact among the supervisor and the interviewers was not possible after the school.

Many of the questions were open ended because we had little basis for expecting what the answers might be and we were hoping to get as wide a range of complete responses as possible. We desired that the interviewers record answers as completely as possible and probe for exhaustive answers. This ideal was often not achieved. Although it is typical of survey research that complete verbatim responses will not be recorded, it is apparent from many of our interviews that incompleteness of recording resulted not only from the physical impossibility of doing the ideal complete job, but also from interviewers' preconceptions based on their professional training. The difficult but not impossible task of getting the interviewer to record as much as he can regardless of his ideas about its importance must be faced in sample survey research. The professional may find it more difficult than the nonprofessional to remain open-minded about the responses he is getting.

Our experiences suggest that it is crucial to arrange for adequate interviewer training and supervision. Maximum effectiveness at these points is recommended even at the cost of other aspects of the study. In our case, improved training and supervision might have been worth a decrease in sample size. Personal contact between the interviewer and his supervisor is indispensible if a difficult interview schedule is to work satisfactorily.

Systematizing Data for Analysis

We are now in the midst of systematizing our data by the coding process. Problems similar to those already discussed have arisen. Although we think that we may have met these problems satisfactorily, it is still too early to tell whether or not our efforts have been successful. Perhaps it is worth mentioning just one of these problems and our attempt at a solution.

In almost any sample survey some questions will fail to elicit responses

about the subject desired. When this happens the coding categories on which the investigators planned can not be used. In our study, it was decided not to treat the responses to these weaker questions as unusable. Instead, questions about the subject under investigation were devised and the respondent's remarks were examined for answers to these newly phrased questions that could not be put to the respondents directly. This technique has been used in the coding of four or five questions and it is hoped that it will result in a useful residue of materials for analysis. If the questions that have been put to the data can be answered from the responses on a majority of schedules, and if planned analyses can be pursued on the basis of these answers, the technique and its advantages can be illustrated in more abundant detail.

Conclusion

One would be incorrect to conclude from this discussion of problems that our data will not permit us to pursue a fruitful analysis of many aspects of the decision making process. The truth of the matter is quite to the contrary. The execution of any empirical research project necessitates a series of compromises with an ideal research design. These remarks concern problems that have arisen from compromises we have found necessary in using the sample survey technique. In this sense the analysis is limited. However, the survey technique has wide utility and much to recommend it. Many in the audience will at some time find themselves applying this technique and facing many similar problems. At that time they may find that our experiences are a useful source of suggestions for meeting some of their problems.

THE FRIEDMAN-SAVAGE UTILITY HYPOTHESIS IN THE INTERSTATE MANAGERIAL STUDY*

GLENN L. JOHNSON
Michigan State University

FOR years economists have been interested in the utility of income in relation to the chance taking and insuring activities of people. In the field of farm management, the interest is even more specific. Resident and extension teachers of farm management must consider the motivating power of prospective income gains and hence the chances that farmers will run to secure such improvements. Insurance, both formal and informal, is also important. Obviously, study of the utility of income or wealth in relation to chance taking and insuring is an integral, fundamental aspect of the study of farm management.

At the heart of the difficulties involved in studying the utility of income, chance taking and insurance are two questions: (1) Can utility be measured cardinally as well as ordinally? That is, can we know *how much* we prefer one situation to another as well as knowing that we do? (2) Can interpersonal utility comparisons be made; that is, can my preference for $10,000 be compared with yours?

The Hypothesis

Von Neumann and Morgenstern, in their book on *The Theory of Games and Economic Behavior*,[1] argue that the ability to make ordinal choices among alternatives involving risk implies an ability to assign cardinal utilities to the individual "goods" or "bads" involved. This argument which was clarified and amplified by Friedman and Savage[2] rests, essentially on the same set of assumptions as indifference analysis. It is argued that my ability to choose among an insured income (on one hand) and some probability of receiving my present income plus some probability of receiving my present income *less* a loss (on the other hand) implies ability to do more than order the three incomes. For me to do this, it is argued that I must be able to know how *much* I prefer my present income over my insured income and my present income less the loss. Unless I know *how much*, I cannot weigh the two risk incomes together and compare the resultant average with the income my insurance company guarentees as a basis for a rational decision. Incidentally rationally is assumed in the argument.

---

* Journal Paper No. 1804 of the Michigan Agricultural Experiment Station.

[1] J. Von Neumann and O. Morgenstern, *The Theory of Games and Economic Behavior*, The Princeton University Press, Princeton, 1944.

[2] M. Friedman and L. J. Savage, "The Utility Analysis of Choices Involving Risk," *Journal of Political Economy*, Vol. 56, pp. 279-304.

The argument, if it holds,[3] makes it possible to measure utility cardinally by selecting (1) an arbitrary origin on my utility function and (2) an arbitrary unit on the scale. This is, of course, what physicists did with heat. The Fahrenheit scale originates, arbitrarily, at 32 degrees below freezing, the unit of measurement being 1/180th of the difference between the freezing and boiling points of pure water at sea level. The centigrade scale is based on a different arbitrary origin and unit.

In the case of utility, the measuring can be done by first determining the probability, P, of receiving one of the risk incomes and, hence, the probability (1-P) of receiving the other which makes a person indifferent between a guaranteed income and the possibilities of receiving either of the risk incomes. Once this is determined, an arbitrary origin can be set at any present income assuming no loss. This, plus an arbitrarily selected unit of measurement, such that there is, say, one util attached to the insurance premium determines a unique utility function up to linear transformations.[4]

An Example

Let us consider an example. Suppose that I am indifferent about purchasing a \$10 policy protecting me against a \$100 loss that occurs 5 percent of the time. This ordinal indifference statement implies the following relationship:[5]

$$\begin{array}{l}\text{Utility of}\\ \text{my present}\\ \text{income less}\\ \text{the premium}\end{array} = \begin{array}{l}\text{Utility of}\\ \text{my present}\\ \text{income less}\\ \text{the loss}\end{array} \text{P} + \begin{array}{l}\text{Utility of}\\ \text{my present}\\ \text{income}\end{array} (1 - \text{P})$$

Or, in terms of our example—

$$-1 \text{ util} = \begin{array}{l}\text{Utility of}\\ \text{present income}\\ \text{less loss}\end{array} \text{P} + (\text{O})\ (1 - \text{P})$$

$$\begin{array}{l}\text{Utility of}\\ \text{present income}\\ \text{less loss}\end{array} = \frac{-1}{.05} = -20$$

Thus we have three *cardinal* points on my utility function:

Amount of Income	*Utility*
Present income	0
Present income −\$ 10	− 1
Present income −\$100	−20

[3] For criticisms of the argument see M. Allais, "Le comportement de l'Homme Rationnel Devant le Risque; Critique des Postulats et Axiomes de l'Ecole Americaine," *Econometrica*, Vol. 21, pp. 503-546.

[4] The premium, it should be noted, is the difference between the insured income and the uninsured income, assuming no loss.

[5] See L. A. Bradford and Glenn L. Johnson, *Farm Management Analysis*, John Wiley and Sons, New York, 1953, pp. 403-410.

Although these estimates are not comparable, interpersonally, they have the following characteristics:

1. They are cardinal, not ordinal.
2. They imply increasing marginal disutility for losses up to $100 because I am willing to give up $10, worth one util, in order to protect myself against an average loss of $5.

If this procedure is applied to various successive losses and gains, it is possible to trace out my utility function for income. When my utility function contains increasing marginal disutility for losses and increasing marginal utility for gains, it is rational for me to engage simultaneously in chance taking and in insurance schemes both at unfair odds. Chance taking for gains at unfair odds does not necessarily imply a personality type. Neither does insuring. The world does not have to be made up of people who are dare-devils, Milquetoasts, and contradictory combinations of both if the Friedman-Savage hypothesis is correct. Instead, it can include rational men of judgment who fear certain losses enough to pay something "extra" to avoid them and who simultaneously value certain gains enough to pay something "extra" (beyond the average) to run the chance of receiving them.

Farmers, according to the Friedman-Savage hypothesis, can rationally pay unfair odds to an insurance company for protection against fire losses while, simultaneously, purchasing land at what appears to be poor odds in order to get the chance of converting from tenancy to ownership status.

More recent developments of the Friedman-Savage hypothesis link the points of increasing marginal utility to levels of aspiration and of increasing marginal disutility to levels of aversion.[6] Following such developments it can be further hypothesized that farmers would accept only fair or more than fair odds for gains below their levels of aspiration but would accept unfair odds beyond such levels. With respect to losses, the corresponding hypothesis is that farmers would accept only fair or more than fair odds for insurance against losses not exceeding their levels of aversion but would accept unfair odds for insurance against losses in excess of these levels. These hypotheses could undoubtedly be expanded with respect to content of and strength with which aspirations and aversions are held.

Attempts at Verification

If the Friedman-Savage hypothesis is useable, it is of basic and crucial importance in the field of management. Past attempts to verify it have taken two forms. First, Friedman, Savage, and others have studied and

[6] H. Markowitz, "The Utility of Wealth," *Journal of Political Economy*, Vol. LX, 1952, pp. 151-158.

found the general actions of people consistent with the hypothesis. Second, limited controlled experiments have been run with real money and real odds. Although the first approach has been fruitful, the second may not involve large enough gains or losses to encounter changing marginal utility or disutility. The controlled experiments to date may have measured the consequences of differences among subjective and objective probabilities rather than differences in utility at different points on the utility function.

As research agencies do not have budgets large enough to carry out controlled experiments involving real major losses and gains, it is necessary to deal with hypothetical situations. Halter and Beringer in a pilot study here at Michigan State University found evidence of increasing marginal disutility for hypothetical losses below $1000, but did not find evidence of increasing marginal utility for hypothetical gains up to $1000.

Empirical Work in the Interstate Study

The empirical work on the Friedman-Savage hypothesis in the interstate managerial study deals with hypothetical situations. Each of between 500 and 600 farmers were asked 36 questions. Half of these questions involved insurance against losses, the other half gambles for gains. Possible gains ranged from $500 to $50,000, while possible losses ranged from $100 to $50,000. Six different levels of gains and six different levels of losses were involved as well as three series of questions, one fair, one more than fair, and one unfair. These series were asked with respect to both insurance and chance taking. Question orders were randomized to prevent the respondent from "seeing the system." Assuming constant marginal utility for income from $40 below to $40 above each farmer's existing income, these data permit computation of six points on each farmer's utility function for money or wealth.

Although the data are now coded, they are not yet on IBM cards and, of course, no analysis has been carried out. A sample of about 100 of the series of questions involving fair, more than fair and fair odds was tabulated. As a matter of chance, one-eighth of these should be expected to be consistent with the Friedman-Savage hypothesis. Actually between 85 and 90 percent of the series were consistent. Although this test of consistency is a relatively weak one, the results are highly encouraging.

Methods of computing the utility function without assuming constant utility for money, $\pm$ $40 from present income, have been partially developed in a series of conferences involving Jacob Marshak, Ingram Olkin and Leo Katz. These methods will be developed further and applied in the final analysis.

Data on income level, net worth, debts, family responsibility, type of

farm, education, age, tenure, etc., will make it possible to determine how the nature of the utility functions is related to such factors. Although interpersonal utility comparisons are impossible, points of increasing marginal utility and disutility can be compared for farmers in various categories. Such comparison should yield significant insights into the decision making process.

Although the data are all in answer to hypothetical questions, we feel, tentatively, that this part of the interstate managerial study is one of its most rigorously formulated portions. We are hopeful that we have some fundamental data of significance in the study of the managerial process.

SOCIOLOGICAL ASPECTS OF THE DECISION MAKING PROCESS*

D. Woods Thomas
Purdue University

IN RECENT years, a rather complete conceptual framework of the decision making process has evolved. This framework, in its broadest form, encompasses concepts and principles taken from economics, psychology, sociology and related social sciences. The purpose of this paper is to examine the implications of sociology relative to the decision making process. This examination will proceed in two steps. First, the relationship of sociology to the decision making framework will be discussed. Second, the degree to which sociological aspects of the decision making process are being investigated in the empirical study under discussion in this series of papers will be indicated.

Sociology is involved in decision making in several ways and at various levels of importance. The first and perhaps most significant implication of sociology to the decision making process is relative to the goals and objectives of managers. The making of decisions implies the existence of objectives toward which decisions are oriented. As agricultural economists, we have generally assumed that the objective of the farm firm is to maximize returns to the productive services employed. This is an extremely useful assumption. It is doubtful, however, if it is a universally valid assumption in the dynamic environment characteristic of the real world in which managers operate. If the unique household-firm relationship of the farm unit is fully recognized, it appears that its objectives are determined, in part, by the social and cultural environment of the farm family. If this is the case, then the objectives of the farm unit are a function of such socio-economic variables as social and economic status, age, family composition, educational level achieved, stage in the family cycle, and the like.

The goals and objectives of the farm family determine the way in which the stock of available resources is allocated between consumption and production and within the consumption and production processes. In this respect, sociology relates to the decision making process to the degree that goals and objectives are socially determined.

Secondly, the concepts and principles of sociology have a direct bearing on the formulation of expectations concerning the behavior of individuals and groups. Managers must take such behavior into consideration in the formulation of production plans and in subsequent adjustments to imperfectly forseen events.

In making decisions, managers attempt to derive the most probable

* Journal paper number 904, Indiana Agricultural Experiment Station.

expected value for those variables or factors bearing on specific problems. Agricultural economists have been concerned largely with physical production relationships, prices and price relationships and technological development. Little consideration has been given the prediction of future behavior and actions of individuals, formal and informal groups and of institutions. Yet, expectations of the latter type are as essential to the solution of certain problems as are those in the former group. Managers formulate expectations relative to individual and group behavior for the same reasons that they formulate, say, price expectations. Consider the importance of the future behavior of hired labor; unpaid family labor; bankers; farm pressure groups; local, state and federal governments and the like, to decisions involving production plans.

Third, an understanding of sociological principles is of value to the manager in situations calling for the use of strategic courses of action. Despite the light that sociology and related disciplines may shed on the prediction of group and individual behavior, it is too sanguine to assume that all such uncertainties can ever be reduced to certainties. This premise indicates that imperfect knowledge in this area will continue to exist. Managers will continue to find it necessary to employ interpersonal and intergroup strategies as a means of hedging against the impact of imperfect expectations concerning the actions of individuals and groups. A knowledge of human behavior in a social environment is necessary in order to choose the most desirable course of strategic activity.

Fourth, sociology bears on the decision making process with reference to the propensity of individuals to avoid losses and seek gains. There is some evidence which suggests that such propensity is related to the socio-economic status of the individual. This status is, of course, a function of both the social and economic environment of the individual or decision making unit.

Consider the possibility of a difference existing between the way in which two individuals, of widely different cultural background and social status, value potential increases or losses in income. Assume that one individual exists in an ultraconservative environment such as that usually associated with, say, the historical New England rural community. Further assume that the other exists in an ultraliberal environment such as that associated with, say, Las Vegas or Reno. If other factors are constant, there is little doubt but that the decisions of two such individuals in solving problems involving insuring against potential losses or taking chances on potential gains would be considerably different.

Hence, it appears reasonable to expect that part of the variability among managers with respect to their propensity to take chances on potential gains or to insure against potential losses is attributable to sociological phenomena.

The final sociological aspect of the decision making process deals with the importance of social pressures in arriving at specific decisions. The bearing of responsibility—both economic and social—for decisions and subsequent actions is an important function of management. In most cases, the economic responsibilities of management are clearcut. While the social responsibilities of management are less apparent and more difficult to appraise, they are just as real as those in the economic sphere.

Consider the extreme example of the Amish farmer faced with the decision of whether to install or not to install an electric milk cooler. If he decides in the affirmative, he may continue to sell fluid milk but at the social cost of being excommunicated by the church. If he decides in the negative, he may no longer sell fluid milk but will be permitted to remain in the church. All this is in a situation where fluid milk production is by far the most profitable farm enterprise and where religious conformity is a necessary condition to social acceptance.

Or consider the case of an Indiana farmer who recently invested some $10,000 in an irrigation system. The source of irrigation water was the same as that of the municipal water supply of an adjacent town. Legally, the farmer had the right to use water from this source for irrigation. After one season's operation, however, social pressure created by the townspeople became so great that he found it ill advised to continue the practice.

The manager must, in making decisions, consider the costs and returns of social disapproval or approval in the same manner as he considers dollar costs and returns. An analysis of the importance of social pressures relative to production or consumption decisions is clearly in the realm of sociology.

At this point let us turn to a discussion of the degree to which the sociological aspects mentioned above are being investigated in the current study.

A primary objective of the study is to determine the kinds of information that managers need in making decisions relative to the organization and operation of a farm business. It is hypothesized that managers require information about the following: (1) physical input-output relationships, (2) prices and price relationships, (3) technological change, (4) political, economic and social institutions, and (5) individuals. The testing of this hypothesis will indicate whether or not managers need information about sociological phenomena such as those implied by items four and five above. In addition, data are being obtained to permit the determination of the relative importance of information, the difficulty in obtaining data and the sources of the several categories of information.

A second general hypothesis is that the decision making models, reasoning processes, and analytical techniques employed by managers are re-

lated to such sociological variables as family composition, age, educational level, and work experience of the manager. The testing of this hypothesis will give some indication as to whether or not such relationships do, in fact, exist.

Third, it is hypothesized that managers formulate expectations concerning the most probable behavior of individuals and of formal and informal groups or institutions. Data have been obtained to permit the testing of this hypothesis. Along this same line, the survey schedule was designed to obtain data that will facilitate the determination of the general nature of human and institutional expectation models employed by managers.

Fourth, a segment of the study is designed to test the hypothesis that managers use strategies in dealing with individuals and groups in situations characterized by imperfect knowledge, risk and/or uncertainty. More specifically, questions were designed to determine if managers use each of several strategic courses of action and to isolate particular types of situations in which managers of farm firms find each strategy to be applicable.

Finally, a phase of the empirical study deals with the hypothesized relationship between sociological variables and the utility functions of decision makers. In view of the fact that this is the subject of another paper in this series, it will not be discussed here.

To summarize, it is fact that production and consumption decisions are made by people. People exist in an infinitely complex social and economic environment. Scarce resources available to decision making units are allocated and utilized in line with a set of goals and objectives that are, in part, socially determined. Many decisions depend upon anticipations of the future behavior of individuals and groups of individuals. Thus, the manager needs information about sociological phenomena in order to formulate expectations concerning their future behavior and to choose the most appropriate course of strategic action to offset imperfectly anticipated events. The propensity of decision makers to insure against potential losses or to take chances on potential gains appears to be, in part, a function of their socio-economic environment. Last, in making decisions managers must consider social costs and benefits as being concrete quantities.

POSSIBLE IMPLICATIONS OF DECISION MAKING STUDIES FOR FARM MANAGEMENT TEACHING AND RESEARCH

LOWELL S. HARDIN
Purdue University

TEACHING and research implications of current activity in the area of managerial concepts are well summarized in Glenn L. Johnson's "Managerial Concepts for Agriculturists."[1] With respect to teaching, Johnson concludes that training emphasis should be placed on ". . . performance of the managerial task . . . inductive and deductive reasoning methods . . . interrelationship between decision-making, action taking and bearing responsibility . . . costs and values of learning . . . interrelationship between home and business, between restricted consumption and investment . . . the conflict between consumption and saving." He makes a plea for teaching ". . . various strategy, insurance, chance-taking and flexibility principles."

This suggests that at least some of our resident and extension teaching of farm management is too narrowly circumscribed. It may be reasoned that too little attention is given to the wants, preferences and goals of farm families; that human, financial and related resources are inadequately evaluated; and that data, information and inductive teaching are emphasized, rather than working through the decision making process realistically.

Management involves knowledge of much more than cropping and livestock programs. When, where, and from whom should the learner acquire working knowledge of the many concepts needed? Should the farm management teacher become the "universal specialist," broaden his offerings to include the range from philosophical value concepts to details on production relationships?

In the land grant college system many areas of specialization in both teaching and research have been developed. In fact, some feel that specialization has been carried too far. As economists we recognize the principle of specialization and its attendant efficiencies. Application of the principle to teaching and research has sometimes resulted in a narrow definition of farm management. Some have defined the ends or goals exclusively in terms of monetary returns; nonmonetary satisfactions have been excluded. And in considering means to specific ends or goals, the farm's physical resources have often received primary emphasis to the partial exclusion of the possible contributions of home, human factor, off-farm employment opportunities, educational and other institutions.

[1] Glenn L. Johnson, "Managerial Concepts for Agriculturists," Kentucky Agr. Exp. Sta. Bul. 619, 1954, pp. 48, 49.

Such a course of action is, in many respects, a natural one. The narrower the problem, the fewer the alternatives, the more precise the solution—even though the solution may be of little value because it is unrealistic. The teacher appears to know his subject; he teaches those things he knows best; he gets answers. And he can rationalize that no student's education has its alpha and omega in his classroom or meeting. The student is continually going through a formal and informal educational process. This course or this meeting is but one small portion of the learner's total educational experience.

If the teacher does broaden his definition of farm management both as to means and to ends, he often turns to the case or discussion method of instruction. Frequently this is good, for properly handled it forces consideration of goals, values, disciplines and alternatives that might otherwise be ignored. In another sense, though, the discussion method may be a crutch. It may be substituted for more direct, concise and effective methods of teaching the principles and concepts of management (1) because the teacher feels that the broader approach to management has not been fully and concisely developed, or (2) because the instructor hasn't developed for himself a broad concept of the total decision making process, or (3) because he feels that through discussion more realism is achieved. That which students have learned from other educators or experiences is made available to the group. Certainly the third reason is a good one if the students have knowledge on which to draw.

Many of us teach farm management. Have we seriously asked ourselves such questions as these? One, are we giving students information and data or are we teaching them to think? Two, are we making the so-called scientific method—observation, analysis, decision making, action, bearing responsibility—an integral part of our students' working tools? Three, do we adequately and objectively consider goals and personal preferences? Four, are the resources other than the monetary and physical ones realistically evaluated? Or do we feel fairly well satisfied when our students are able to budget through alternative farm organization and operation plans under the assumptions of unlimited capital, a high level of managerial ability, stated price relationships and a goal of maximizing net income?

What then are the implications of research in decision making concepts? The research to date probably sheds more light on what the manager needs to know than on how to teach it to the prospective or practicing manager. The research suggests that when we more fully determine what makes a good or poor manager, the answers will be interdisciplinary in character. Economics is likely to be one of several contributing disciplines to management, rather than management being conceived as a sub-

field of economics. If ability to reason deductively, to determine and perhaps influence attitudes and goals of people, to work effectively with the human factor and related concepts are as important as we now envision, then *what* the successful manager needs to know and do (or not do) is broader than what is often taught as farm management.

If we agree to the above, how do we teach farm management? Is it reasonable to expect one resident teacher or extension specialist to cover such a broad area? Except for the select few, the answer is probably no. Herein lies one of the greatest challenges to research. Shortcomings in teaching are in themselves an effective case for research in the area of solving managerial problems. Until we know more about how individuals and families do make decisions, we will not know exactly how to teach them decision making. It is the job of researchers, therefore, to discover how people make decisions.

Apparently an interdisciplinary approach is called for. Through a task force approach, the research can be made truly interdisciplinary in character. Managerial concepts and principles can take shape independent of historical, departmental or disciplinary lines. From such joint approaches, a solid framework will emerge. Gradually the concepts involved will become more concise and more meaningful at least to serious students and to above average managers. Gradually, that which a man, woman or family unit does or does not do to become good or poor managers will be defined. As this occurs, methods of increasing one's skill in performing managerial tasks will become more evident. Then we will decide whether or not managerial concepts are taught by educators from one or from several disciplines. I suspect that as existing voids are filled we will alter our curricula and our extension subject matter offerings. But the training of the manager, like the conduct of the productive research, will probably be a joint activity of many different minds, disciplines and experiences. Although there is much that the teacher can now do, the greater challenge is to the researcher. If the research is well done and if the findings are genuinely useful, a way will be found to teach them.

POSSIBLE IMPLICATIONS OF THE NORTH CENTRAL INTERSTATE MANAGERIAL STUDY FOR FARM AND HOME DEVELOPMENT PROGRAMS

EARL O. HEADY
Iowa State College

THE total implications of the interstate managerial study for farm and home planning programs are greater than can be explained in 10 minutes. However, some high lights can be pointed out. One very important relationship deals with use of inductive and deductive processes in managerial decisions. Questions included in the survey attempt to determine what portion of farmers think inductively or deductively in making particular decisions. These findings should be basic to any extension program, regardless of the subject matter area.

Preliminary observations suggest that some operators are able to use both deductive and inductive processes equally well in formulating alternative plans or courses of actions and, finally, in selecting the one plan to put into operation. Others rely mainly on induction. There is, of course, nothing unique about this stratification. It exists even among research workers. Some easily use both deduction (i.e. basic theory or principle) and induction (i.e. empirical verification of hypotheses or postulated solutions of problems). Others find deduction (basic theory or principle) quite distasteful and choose to emphasize purely descriptive approaches (i.e. to get immediately to the facts).

Determination of the strata of farmers that are able to use deduction, as well as induction, would allow the following extension procedure: Farm operators can be given the basic principles (i.e. the deductive apparatus for planning) and, after some training, be expected to make out their own farm and home plans. But isolation of the proportion and location of inductively minded farmers is just as important. First, extension workers should attempt to determine what numbers of these also can be taught basic principles, or be converted from a pure inductive thinking procedure to a channel that includes some ability in deduction. Second, an entirely different program should be devised for farmers who can use nothing but induction. These farmers have to be able to *see the facts*, before they can comprehend what is involved in plan and how it can be accomplished. They cannot work efficiently with a general principle but must have empirical solutions or plans provided for them.

A farm demonstration is, then, a procedure for an inductively oriented farmer. He can see the facts without using or exercising a great deal of imagination. Perhaps one could say that the early philosophy of extension work, based on farm demonstrations, assumed that managerial or

decision procedures of farmers rested alone on induction. A second approach for a farmer who can use induction alone is to have a farm plan made out for him. The type of planning conducted by SCS rests on the assumption that farmers mainly think inductively; that they must have a plan made out for them where they can "see the facts on paper."

The beginning knowledge provided by the interstate managerial survey, plus knowledge that may be provided by other needed studies, may well encourage two different directions in extension farm and home development programs: (1) more education in planning principles and procedures for farmers who can use deductive procedures, and (2) more (a) demonstrations based on plans that have already been put into effect by leading farmers, and (b) actual making of plans for farmers who can use only inductive procedures.

Incorporation of Uncertainty

A second major aid in farm and home development programs is evaluation of uncertainty and risk aversion in decision making. The study attempts, in selected areas, to determine the types of decisions for which farmers (1) are extremely cautious in making decisions and (2) are subjected to great mental uneasiness after the decision has been made, as compared with decisions where the outcome appears (subjectively) fairly certain and there is no particular cause for "mental torment" once plans have been adopted. Knowledge provided by this part of the study should aid extension workers in determining subject matter areas where farmers need more detailed information on outcomes, so that they will not have to exercise such extreme uncertainty precautions as are now prevalent. Informational detail needs to be expanded particularly to those decisions where farmers are extremely cautious and worry greatly about outcomes. The degree of uncertainty in data may well need to be indicated. Rather than to provide only the mean yield outcome of a crop experiment, for example, the extension worker may need to provide ranges and probabilities of different outcomes (as represented by fiducial limits, the coefficient of skewness, or the minimum "possible" yields). Similar approaches may be needed for such "economic" quantities as prices of products to which great uncertainty is attached.

The study enumerates the kind of uncertainty precautions or planning strategies now used by farmers. These results should be studied carefully by extension workers. One danger in extension farm and home development programs is that planning will be explained too nearly in a static framework. Planning instructions are incomplete if they do not explain to farmers the kinds of *ex ante* uncertainty precautions that can be used, and their possible *ex poste* costs. The regional analysis should indicate

areas in which there are gaps and where farmers need more information on uncertainty precautions.

Finally, on the risk or uncertainty side, the study indicates the kinds (odds) of chances farmers are willing to take. Since a classification of farmers can be made by capital position, age, family responsibilities, education, farming experience and type and perhaps by psychological makeup, it provides another guide for beaming information to farmers. The summary should indicate which group of farmers is willing to plan under conditions of "long odds"; it should indicate which farmers are highly conservative and for whom recommendations should be geared accordingly. In other words, this phase of the study will help to take extension education out of the realm of "blanket recommendations" and stratify it in a more useful manner, by the decision making characteristics and environments of individual operators.

Kinds of Information Needed

Summary of the data will indicate types of additional information that farmers in total believe they need for improved planning and will indicate the types of information most needed by different groups of farmers. The summary could even be used to suggest the relative needs for extension specialists in the various fields of technology, economics and other social sciences. Certainly the study indicates that farmers need increased information in the field of economics. For example, 94 percent of the Iowa farmers sampled indicated need for various kinds of economic information for successful planning. A total of 64 percent indicated a need for more outlook information. Only 43 percent indicated a need for more information on crop varieties and fertilizer; 33 percent indicated a need for more information on livestock feeding; and 25 percent indicated a need for more information on machinery. However, considerable differences were expressed among groups. The proportion of young farmers expressing a need for information on outlook and crop varieties was twice as great as for farmers more than 50 years in age. The proportion was reversed for information on government programs, with older farmers expressing the greatest frequency of need. Only about half as many young farmers (35 years being the dividing line) as older farmers expressed the need for more information on livestock breeding.

Expectations

The survey measures farmers' expectations and the procedures that farmers use in arriving at their "judgments of the future." Extension work is to a large extent a specialized public activity designed to provide farm expectations. It does not provide the facts, in the sense of single-valued

probability distributions, but only one or more of numerous possible yield, production, social or price outcomes. The survey provides some basis for determining how effective extension specialists provide farmers with expectations. Expectations provide the very foundations upon which plans are based. Therefore, greater knowledge of the expectation models employed by farmers, and their efficiency, can suggest the need for new approaches in this important area.

Basis of Principle

The interstate managerial study has a broad basis for extension education and farm planning. This is especially true since relevant management or decision making principles have served as the framework of design for the study. The analysis should provide some guide as to which of accepted firm theory and principles have greatest relevance in extension education and should indicate areas in which extension personnel need to attach "better handles" to particular economic principles used in planning (i.e., in decision making processes). As one example, the study includes an interpretation (1) of what proportion and (2) of how well, farmers use *marginal* principles, as compared with *breakeven* principles, in deciding on hog marketing weights. The regional analysis is, after all, an attempt to evaluate those decision making procedures that should be the operational goal of a program in farm planning conducted by any state extension service. In this sense, it could well serve as a benchmark. Comparisons can be made at a later point in time to determine the effectiveness of farm and home development programs in improving the managerial abilities of farmers.

ECONOMIC-LEGAL APPROACH TO AGRICULTURAL PROBLEMS

Chairman: Marshall Harris, Agricultural Research Service, USDA

INTEGRATION OF LAW AND ECONOMICS IN ANALYZING AGRICULTURAL LAND USE PROBLEMS[1]

JOHN F. TIMMONS[2]
Iowa State College

I

THE purpose of this paper is to explore some of the fundamental considerations relevant to integrating law and economics in analyzing problems of agricultural land use. This purpose is approached through brief inquiries (1) into the nature of agricultural land use problems, (2) into the need for integrating law and economics in analyzing these problems, (3) into the nature of law and economics as social disciplines including their respective objectives, content and methods, and (4) into some major agricultural land use problems inviting law and economics joint inquiry.

Before proceeding further, some comments on the philosophy within which the above purpose is approached, appear in order. These comments, which may be regarded as hypotheses for directing this discussion, are as follows.

The laws governing how land is held, transferred and used, influence human behavior in making economic decisions just as the economic principles influence the development of land laws. Furthermore, legal techniques provide important potential means for implementing the achievement of economic objectives. This means that the economist cannot ignore or assume away the legal framework within which economic decisions are made without losing relevance with the problems he seeks to solve. This also means that the legalist cannot ignore or assume away economic objectives without losing direction in the functioning of the law.[3]

---

[1] Journal Paper No. J-2805 of the Iowa Agricultural Experiment Station, Ames, Iowa. Project No. 1043. Presented at the Annual Meetings of the American Farm Economics Association. East Lansing, Michigan, August 2, 1955. The author acknowledges the helpfulness of his colleagues in interdisciplinary inquiry, particularly Professors John C. O'Byrne, Marshall Harris and John A. Nordin, through many stimulating discussions on some of the ideas presented herein.

[2] Professor of Economics, Iowa State College, Ames, Iowa.

[3] For an interesting discussion of the interrelationships between law and economics in the processes of public control of economic activity, see I. L. Sharfman, "Law and Economics," The *American Economic Review*, Vol. XXXVI, No. 1, March 1946, pp. 1-19.

Therefore, students of law and economics must work together in resolving those problems of land use whose origins and possible remedies reach into both disciplines.

Law, or more appropriately, the science of jurisprudence, is a framework of means for ordering human behavior.[4] As such, law draws its ends from the totality of social sciences—not just economics. Therefore, the law must embrace political science, sociology, ethics and other social disciplines as well as economics in serving mankind. In this respect, law becomes a unification of means for regulating human behavior in achieving the manifold objectives of humanity in a more or less orderly manner. Thus, to a degree, economics must be fitted to the law just as the law must accommodate economic objectives. This process leads to certain imperfections and compromises some of which are unavoidable in the functioning of our social, political and economic system.

II

Land problems as interpreted in this paper are defined in terms of conflicts, confusions and uncertainties regarding future courses of action in the use of land. To the practicing lawyer, these conflicts become obvious since they are brought to him by the parties in conflict. To the social science researcher, however, these problems may be vague, inarticulate and obscure but none the less real. The crux of land problems, as defined for inquiry, lies in the choice making process. People as private individuals, private groups, legislators, administrators, educators, and as acting in other public and private roles, are confronted with problems of making choices among alternative courses of action. Some of the conflicts, confusions and uncertainties regarding future courses of action stem from insufficient knowledge of and uncertainties associated with expected consequences of particular alternative courses of action. Others stem from expected consequences being in conflict with desired results.

Thus, land problems as interpreted herein are essentially *ex ante* in nature. *Ex post* aspects of land problems are considered relevant only insofar as they aid in the understanding of problems and probable consequences of different courses of action.

The function of problem solving research is to provide ideas and facts useful to private and public individuals and groups (1) in resolving conflicts, (2) in bringing order out of confusion, (3) in removing uncertainties associated with future courses of action, and (4) in devising means for bringing about desired consequences.

The norms sought by people in making decisions on the use of land

[4] For a further elaboration of this idea, see Rudolf Von Ihering, *Law as a Means to an End*, New York: Macmillan Co., 1924.

include production, distribution and stability elements. The production norm is concerned with obtaining the maximum of goods and services in terms of effort expended from both public and private viewpoints.[5] The distribution norm is concerned with the distribution of costs and benefits in the production process. The stability norm is concerned with providing a continuing flow of goods and services in an orderly manner.

If land is to be used in the production process, it must be possessed. The nature of this possession (defined by law) determines the share of the benefits and costs received and borne by the possessor(s). These expected benefits and costs, in turn, motivate the user(s) of land to follow certain practices that may be in conflict with the productive and stability norms.

For example, the farm tenant with only a one year planning horizon limited by an annual lease with no compensation provision is motivated (1) toward disinvesting the land he operates or (2) away from making investments with deferred income. The Iowa lease termination law serves to extend the tenant's planning horizon by four months, but this is still short of a planning horizon necessary to meet the production norm in today's agriculture. The English have achieved considerable success in using compensation laws to extend the planning horizons of tenants. Without going into details of farm leases, which have been discussed at length in both economic and legal literature, the important point here is that the farm lease is *both* a legal and an economic document. The contributions of the legalist as well as the economist are essential in analyzing leasing problems and in working out solutions.

This lease example, which will be dealt with in more detail later in this paper, provides a minute example of the need for integrating law and economics research. Let us turn now to broader considerations of integration.

III

The momentum of extreme specialization in economics, in law, and in other disciplines may well have spent itself, for the time being at least. The old quip that the specialist knows "more and more about less and less" is not without some elements of truth. A quarter-century ago, chemists and physicists had concluded that each discipline had encompassed all there was to know about their respective areas of study. However, when the more skeptical and persevering scholars penetrated the academic curtains thrown around the two disciplines and partook of the treasured stores of knowledge within each, atomic energy was born with

[5] This norm embraces conflicts that may arise in defining and in realizing public and private maxima.

all its possibilities for mankind's future. There is emerging evidence that social sciences as well are entering a new era of integration. There is increasing evidence that major problems demanding the attention of social scientists are falling through the slats of specialization. Today, the sensitive thinker in pursuit of knowledge within his own field, finds himself constantly bumping against and well into the frontiers of other disciplines.

The economic theorist, Kenneth E. Boulding, has emphasized his "... growing dissatisfaction with the present state of economic theory as generally conceived and taught" because of "... the failure of economics to integrate itself into the general body of social science."[6] Boulding concludes that he has been "... gradually coming under the conviction, disturbing for the professional theorist, that there is no such thing as economics—there is only social science applied to economic problems."[7]

The legal theorist, Huntington Cairns, comes to a similar conclusion about the law when he says, "The subject matter of jurisprudence does not warrant itself. The determination of its validity demands an extension of thought into that area which is the general meeting ground of those subjects whose aims are similar."[8]

Cairns continues, "The first principles that legal theory seeks to establish will be based upon foundations that are not the product of juristic thought."[9] Similar to Boulding's reasoning on the future of economics, Cairns in his reasoning into the future of jurisprudence concludes that "Law as a branch of knowledge must endeavor to share in the ultimate intelligibility which is the ideal goal of all science. The analysis of jurisprudence, if carried out in accordance with present methods, will yield a greater knowledge of the concepts of the legal order; but unless a movement in the opposite direction, towards the discovery of necessity, is also conducted, legal thinking will never participate in the mutual benefits which the sciences have always shared."[10]

It is encouraging to find leading theorists in both law and economics becoming cognizant of the limitations of their respective disciplines and advocating the essentiality of interdisciplinary inquiry.

Of course, Prof. John R. Commons was always aware of the interrelatedness of law and economics and practiced this philosophy during his entire professional career. His views on the requisite interrelation-

[6] Kenneth E. Boulding, *A Reconstruction of Economics*, New York: John Wiley and Sons, Inc., 1950, p. VII.

[7] *Ibid.*

[8] Huntington Cairns, "Legal Theory," *Rutgers Law Review*, Vol. 9, No. 2, Winter, 1954, p. 391.

[9] *Ibid.*, p. 391.

[10] *Ibid.*

ships between law and economics were elaborated into a system termed "institutional economics" in his *Legal Foundations of Capitalism*, in his *Institutional Economics*, and in *The Economics of Collective Action*.[11] In the latter work, Commons concludes that "If economic investigations are to implement the search of mankind for liberty, security, justice, equality, or other great goals it would seem that economists must analyze these political, economic and social relations by which the values are made available to, or secure for, the individual."[12]

Despite current tendencies in economics to reduce all analysis to cardinal measurement, the underlying problems with which economics must come to grips continue to be "political economy" in nature necessitating ordinal analysis as well as cardinal measurement. And sooner or later economics as a discipline must broaden itself to encompass the pressing problems of our time. Prof. Boulding realizes the need for this change. Yet, despite his excellent case for integration, Boulding quickly proceeds with pushing economic analysis into further specialized pigeonholes of irrelevancies and minutia. In fact, Boulding emphasizes that the "original" claim of his work on "Reconstruction" ". . . is based solidly on the concept of the profit-making process as the gross growth in the value of net product developed at the microeconomic level."[13]

The contributions of Commons and Wehrwein in the fields of labor legislation and rural zoning, respectively, drew heavily upon both law and economics. The contributions of Keynes and Hicks in developing theories of employment and production, respectively, provide major foundations for modern economics. However, the "institutionalists," meaning Commons and Wehrwein, failed to formulate adequately the fundamental structural relationships indigenous to the problems on which they worked, just as Keynes and Hicks failed to provide adequately for the institutions within which economic decisions are made and carried out.

Actually, I cannot find any basic reasons for necessary conflicts between so-called "neo-classical" and "institutional" economics.[14]

The logical analytical framework and tools provided by Hicks, Keynes and others are essential—but not sufficient—in resolving conflicts, bringing order out of confusion and increasing certainty in the decision making

---

[11] John R. Commons, *Legal Foundations of Capitalism*, New York: Macmillan Co., 1924; *Institutional Economics*, New York: Macmillan Co., 1934; *The Economics of Collective Action*, New York: Macmillan Co., 1950.

[12] *The Economics of Collective Action*, Op. cit., p. 22.

[13] Boulding, *Op. cit.*, p. VIII.

[14] For an excellent discussion of "institutional" and "pure" economics, see George S. Wehrwein, "Institutional Economics in Land Economic Theory," *Journal of Farm Economics*, Vol. XXIII, No. 1, February, 1941, pp. 161-170, particularly, pp. 162-163.

process. The emphasis upon institutions, particularly legal institutions, as mean for the control, liberation and expansion of individual action, by Commons, Wehrwein and others is equally essential—but not sufficient—in the solution of problems. Both are complementary within their total range of usefulness: Neither is sufficient by itself to embrace all the major elements of the problems it strives to understand and solve. This realization appears fundamental and prerequisite to proceeding with integration of law and economics. At least, this is the philosophy with which I proceed in developing the following ideas.

Although there have been numerous attempts of interdisciplinary research, we are concerned here only with those in economics and law as applied to agricultural land use. Harold Ellis has reviewed recent attempts of collaboration between law and agricultural economics.[15] The projects summarized in the Ellis article are encouraging but upon closer inspection it becomes apparent that we have not yet arrived at a philosophical framework for fruitful interdisciplinary studies of law and economics. To date, the contributions of law and economics have been layered together like brick and stone and are equally obvious. Certainly an adequate framework for integration remains to be developed. However, prior to further attempts at integration, careful attention must be given specifically to what we are integrating and how to approach the integration process. Extreme care must be exercised that errors in the specialized disciplines are not converted into erroneous interdisciplinary findings.

IV

Economics as a discipline deals with the maximization of utilities (defined as human want satisfactions) achieved through use of scarce resources. This definition applies to all the units of economic organization that are involved in making and carrying out decisions geared to want satisfactions. These decision making units include the individual firm such as a farm, the private and quasi-public forms of economic organization such as a watershed, and public forms of economic organization such as a river basin or a legislature making decisions concerning resource development.

Law on the other hand, as a discipline deals with ". . . an order of human behavior. . . ."[16] or ". . . action in conduct under sanctions."[17] The

[15] Harold H. Ellis, "Collaboration Between Law and Agriculture," *Journal of Legal Education*, Vol. 7, No. 1-5, 1954, pp. 65-78.

[16] Hans Kelsen, *General Theory of the Law and State*, Translated by Anders Wedberg, Cambridge: Harvard University Press, 1945, p. 3.

[17] Paul Sayre, "Normative Elements in the Law," *Iowa Law Review*, Vol. 38, No. 1, Fall, 1952, p. 44.

legal theorist, Roscoe Pound, regards the law as a form of social control ". . . that is, of the control of the conduct of each of us by the pressure of our fellow men. . . ."[18] Thus, law is primarily concerned with the ordering of human behavior or of conduct under sanction. If narrowed to the scope of this paper, law is concerned with the ordering and conduct of those aspects of human behavior involved in making economic decisions pertaining to the use of agricultural land. This order and conduct, underpinned by legal sanctions, consists of statutes, court decisions and interpretations, customary practices and administrative rulings. These sanctions, whether in force or whether expected to come into force, affect and are affected by economic motivations and decisions and in this way influence the extent to which economic objectives are achieved.

Laws are made by man and may be changed by man to enhance his welfare. Roscoe Pound in his essay "Philosophy of Law" approvingly summarizes Duguit's views ". . . postulating that the law of property, and indeed all law, grew up to meet economic needs and that its development had accorded with economic needs. . ."[19] However, it becomes obvious that changes in law lag behind economic change. This lag, although at times interfering with economic progress, provides a stability in the rules governing human behavior.

Let us now turn to the methods whereby economic and legal objectives of similar nature are defined and achieved in order to provide us with the basic ingredients of our interdisciplinary integral.

In current economic analysis the maximization objective is defined and achieved at the level of the firm in terms of the transformation of input values into output values. These two sets of values are related in the Hicksian formulation by starting with the physical production functions and ending with economic conversions of value inputs to value outputs through the use of market-determined prices or weighted expressions of ordinal human preferences not always determined in the markets. The combination of all these variables—inputs, outputs and prices—provides the opportunity function that indicates various alternatives or possible combinations of the variables available for economic decision making.

At this point, expectations derived from law also enters as one of the variables affecting economic decisions.

In elementary economic theory, the net revenue, or the difference between the value of outputs and the value of inputs, is assumed to be maximized where this net revenue is greatest. This point, together with

---

[18] Roscoe Pound, "Juristic Theory in the Atomic Age," *Rutger's Law Review*, Vol. 9, No. 3, Winter, 1954, p. 464.

[19] Roscoe Pound, "Philosophy of Law," *Twentieth Century Philosophy*, Edited by Dagobert D. Runes, New York: Philosophical Library, 1943, p. 36.

the position of all other variables on the opportunity function, provides the equilibrium position of the firm—a position from which any change in the underlying variables reduces the output of goods and services. The theory of group maximization of goods and services as applied to a watershed, for example, follows the same reasoning except that application of the theory is complicated by numerous participants in the economic organization and multiple purposes to be maximized. The same general theory holds for economic decision making by public units of economic organization, except that the participants, purposes and values are more widely dispersed and more difficult to isolate.

Let us look briefly, and perhaps superficially into the nature and role of the law as it affects and is affected by economic decisions.

In summarizing the scope and content of the legal system, Roscoe Pound sets out the objectives as "(1) to take an inventory of the interests which press for recognition and generalize and classify them; (2) to determine the interests which the law should recognize and seek to secure; (3) to determine the principles upon which such interests should be defined and limited for the purpose of securing them; (4) to consider the means by which the law may secure them when recognized and delimited; and (5) to take account of the limitations upon effective legal action which may preclude complete recognition or complete securing of interests which otherwise we seek to secure."[20]

Insofar as the "interests" Pound emphasizes are the maximization of those want satisfactions with which economics is concerned, Pound outlines a framework for integrating law and economics. His first three points may well be interpreted to include the determination of economic objectives and the principles and conditions leading to their achievement. His fourth and fifth points are also relevant inasmuch as they deal with the means available in the law for achieving the economic interests included in the first and second points through the use of principles covered in the third point.

This interpretation seems warranted by Pound's further reasoning that "Everyone is seeking to realize all his expectations to their full extent out of a limited store of available means of satisfying them."[21] In this reasoning, Pound has suggested the core of interrelatedness between law and economics. In seeking to realize expectations (regarding want-satisfactions) to their full extent from limited resources, human beings necessarily draw upon economic analysis as well as legal means for attaining some of these satisfactions.

---

[20] Roscoe Pound, *Outlines of Lectures on Jurisprudence*, Cambridge: Harvard University Press, 5th edition, 1943, p. 96.

[21] Roscoe Pound, "Juristic Theory in the Atomic Age," *Op. cit.*, p. 465.

Thus, we may conclude tentatively, at least, that the common objective of maximization of human satisfactions pervades the core of interrelatedness of both law and economics. However, economics can specify the conditions necessary for the achievement of only the economic aspects of this objective. Law can provide some of the means whereby the economic elements of this objective are achieved. However, in providing these means, people must be informed of the consequences of the law as related to particular courses of action. As Justice Holmes has observed, the object of the study of law is ". . . the prediction of the incidence of the public force . . . every new effort of legal thought is to make these prophecies more precise. . . ."[22] The more precise these prophecies can be made the greater the certainty of expectations of the incidence of the law will be in the making of economic decisions. In this respect, the uncertainty of the law resembles the uncertainties of prices, costs and yields as variables in making economic land use decisions. However, as Jerome Frank has reminded us, "Much of the uncertainty of law is not an unfortunate accident; it is of immense social value."[23] Frank emphasizes the failure to distinguish between this uncertainty of the law and the flexibility that the law must possess in order to accommodate changing conditions.

Here, however, we should differentiate two phases of the law as reflected in economic decision making.

In developing his utilitarian system of human behavior, Jeremy Bentham divided jurisprudence into two parts, (1) "expository," which determines what the law is, and (2) "censorial," which deals with what the law should be (the latter has been described as "subjective and authoritarian intuitionalism" by Professor Yntema).[24] This is quite similar to the concepts of "positive" and "normative" economics developed by Professor Friedman.[25]

Both the "expository" and "positive" elements of law and economics are required to help determine the "censorial" or "normative" directions of the law and economics, respectively. Applications of the expository to the censorial are well recognized in law just as are the positive to the normative in economics. However, future research must integrate the two by showing the interrelationships between the expository and posi-

[22] Oliver Wendell Holmes, *Collected Legal Papers*, New York: Columbia University Press, 1921, p. 167-168.

[23] Jerome Frank, *Law and the Modern Mind*, New York: Tudor Publishing Co., 1935, p. 7.

[24] H. E. Yntema, "The Rational Basis of Legal Science," *Columbia Law Review*, 1931, p. 925.

[25] Milton Friedman, *Essays in Positive Economics*, Chicago: The University of Chicago Press, 1953, Part 1.

tive, *i.e.*, what is the law and how does it affect economic decisions as well as effects of economic decisions upon the nature of law.

Three tentative conclusions may be drawn from these analyses of the legal framework within which economic decisions are made. First, both law and economics are concerned with the maximization of want satisfactions. The identification of those satisfactions within the scope of economic analysis and the conditions underlying their achievement provides the basis for the contributions expected of economics. The extension of economic analysis to further define and develop the necessary conditions for achieving a wider range of want satisfactions is a challenge for the future. Second, law may be expected to provide more reliable predictions of the incidence of public control upon alternative economic decisions. This will involve an extension of legal inquiry into the law-inaction area to determine more precisely how the law motivates and affects human behavior in making economic decisions. Third, further legal means should be developed as alternatives for achieving economic objectives, and such means should be appraised in terms of implementation of these objectives. This will involve both discovery and invention of new and untried legal devices.

V

We observe, in continuing our inquiry into a philosophical and methodological framework for integrating law and economics, that all disciplines study individuals at some level of generalization in the interaction among these individuals and their aggregates. The unit of study in economics is the decision making unit whether it be a farm, a household, a watershed, an industry, or an economy. The behavior of the decision-maker, in making choices among alternative courses of action, is the crucial factor in the economic unit in determining what "has" happened in a positive sense as well as in determining what "should" happen in a normative sense.

The unit of study in law is the transaction: that is to say (in our consideration here) the interactions among economic decision-making units, and the interactions within the units (where more than one participant is involved). The law provides working rules, with varying degrees of consequential uncertainty, for decision making where such decisions affect anyone other than the one making the decision.[26]

Each discipline, whether social or physical, adopts the concept of an equilibrium as a norm to indicate a state or condition or set of conditions, whereby the optimum achievement of the implicit objectives are realized (under given limitational assumptions) for their respective units

[26] The implied exceptions are extremely rare in our complex society.

of study. This equilibrium may be maximum net profits to a farm or the most satisfactory settlement of a conflict between two people in dispute. The concept as applied to economics was presented earlier in terms of that point on the opportunity function of decision possibilities from which any variation would reduce the forthcoming want satisfactions. The equilibrium concept as applied to law has been implied extensively in legal literature and is that solution within the possible range of decisions (opportunity function of legal possibilities) whereby the total satisfactions are maximized. This equilibrium in law may be stated in terms of "reasonable value" or "justice" or some similar term connoting satisfaction.

The equilibrium concept in economics as well as in law, assumes that all the negative as well as all positive factors at work in a particular situation are identifiable and accountable in the analysis of problems and possible solutions. In economics, these factors to be associated in the equilibrium determination are expressed in terms of inputs and outputs, costs and returns, outlay and benefits, etc. In law, these factors to be associated are expressed as burdens and bounties, which are the counterparts of economic costs and benefits. The law is largely concerned with making people responsible for the consequences of their action. That is to say, the law endeavors to prevent people from shifting (or dissociating) the costly consequences of their action to others while retaining the beneficial results. The burdens and bounties of the law include not only the costs and benefits, as defined in economics but also include utilities and disutilities beyond the scope of conventional economic analysis.

The motivation of both economic and legal reorganization (changes) is to make the participants (affected by the reorganization) as a group better off than before and to bring about an association of the benefits and costs for each participant involved in the process. This general principle is basic in welfare economics and its incorporation into law was recognized in the 5th and 14th amendments to the Constitution and in numerous applied instances such as "nonconforming" users in the application of the police power in rural zoning.

Too often, the economist and the legalist use the convenient dichotomy of exogenous and endogenous factors for not going beyond their own area of specialization in analyzing the association-dissociation complex. In this dichotomy, the exogenous factors are regarded as disturbing forces from the outside and are dismissed or ignored as inconvenient in intradisciplinary analyses.

This dichotomy is satisfactory and even essential as a first approximation in each discipline. However, the economic and legal elements must be unified before the generalizations can be made that are most useful

to people in making economic decisions. Otherwise, we arrive at the impasse of a certain course of action being "economically desirable" but "legally impossible." By this we mean that the law prevents the making and the carrying out of a decision that meets the economic tests of maximization, distribution and stability. To break the dilemma, either the law must be altered to facilitate achievement of the economic objectives, or economic objectives must be altered to meet the sanction of the law, or a compromise between the two must be achieved.

Let us now return to the concept of the "equilibrium" as a meeting ground for law and economics in their attempts to help people reach those decisions that will maximize those want satisfactions with which both law and economics are concerned. Any dissociation of items of cost from items of benefit in economics and of items of burden from items of bounties in law, violates essential conditions in determining what we might term the "equilibrium of maximization."

Assuming that the dissociation of benefits from costs and costs from benefits violates the production norm, interferes with the distribution norm and upsets the stability norm, we shall now turn our attention to some of the major agricultural land use problems currently demanding study. Three broad classifications of dissociations appear relevant to law and economics interdisciplinary inquiry.[27] These are intrafirm, interfirm, and public-private. Each class may in turn be subdivided into intratemporal and intertemporal dissociations. This classification is based upon decision making units from the economic viewpoint as well as upon interactions among and within these units from the legal viewpoint.

Intrafirm problems include arrangements whereby people acquire and maintain farm ownership including intra and interfamily arrangements and landlord-tenant relations. Each of these areas of inquiry subdivide into numerous parts. For example, the problems of acquisition and maintenance of farm ownership by operaters gets into considerations of homestead tax-exemption, purchase contracts, deeds of trust, debt moratoria, limitations on absentee ownership and size of holdings and related legal measures. The possible effects of such measures directed toward the stability norm, for example, or toward noneconomic objectives, must also be appraised in terms of effects upon efficiency of resource use as a test of the production norm. It may well be that society will decide upon courses of action that compromise the achievement of the economic objectives of say efficiency, in order to achieve a little more of another objective. However, this decision can be reached more rationally if research reveals what

[27] Further ideas on dissociation-association theories of benefits and costs at the interfirm level are contained in "Economic Framework for Watershed Development" by the author in this *Journal*, Vol. XXXVI, No. 5, December, 1954, pp. 1170-1183.

is lost in say efficiency relative to what is gained in promoting community stability through say owner-operatorship.

Interfirm or group land use problems are rapidly growing in importance. The recent emphasis upon soil conservation districts and watershed development raises numerous problems of economic and legal character. The determination of the most productive land use system in an area such as a watershed and the distribution of benefits and costs therefrom depends upon as well as provides the partial basis for developing a legal organization whereby people may work together in sharing benefits and costs. With the advent of Public Law 566 and conservancy district legislation in several states, the need for developing watershed organizations that will facilitate the achievement of economic objectives of land use is obviously great.

Both the firm and the interfirm problems of land use, involve elements of conflict between public and private objectives. There is an urgent need for defining public and private interests in land use and for determining the complementary and competitive ranges of such interests. The current situation with respect to water rights is certainly characterized by confusion and uncertainty in the eastern one half of our nation. This problem ranks high in the list of needed research involving both law and economics. The problem of soil and water conservation remains largely unsolved as does the associated problem of land use in terms of major competing uses including forestry, farming, transportation, residential, mineral and industrial uses. Further studies of the exercise of public powers of police, eminent domain, tax and spending are needed in facilitating land use adjustments. The relative advantages and disadvantages of the use of these powers in achieving economic land use objectives remain to be analyzed despite important beginnings that have been made in several rural zoning studies.

VI

We shall now proceed in applying our reasoning by taking an example from each of the three classes. These examples are provided to illustrate principles of interdisciplinary research and are not intended to embrace all relevant subject matter nor all of the necessary inherent assumptions.

In the example of intrafirm dissociation (of an intertemporal nature) let us return to the landlord-tenant relationship (share or cash) introduced earlier wherein the maximum net income of the farm-firm has been determined from the opportunity function previously discussed. This determination involves a current outlay of $500 for terracing that is expected to yield $1,000 to the farm over a period of six years (discounted to a present value). It has been determined that no other use of this $500 would

yield as much returns. In other words, the optimum planning period for this practice is six years, no more or no less, which is specified by the optimum point within the opportunity range. Consequently, the operator should be interested in making this investment toward the end of maximizing net revenue. However, the landlord is not willing to share in the cost of the terraces because of certain burdens, disutilities or noneconomic motives that the investment would entail. Similarly, the tenant with a one year lease is not willing to make the investment because he gets only one half the crop returns and the effect of the terraces results in $300, $200, $150, $125, $125, and $100 returns annually, for six years, in that order. Thus, the tenant's planning horizon is limited to one year by the term of the lease, yet the optimum planning period is six years. Therefore, the tenant's decision is influenced by a $500 outlay coupled with secure expectations of receiving only $150 return (one-half of the first year $300 return).

The law does not assure the tenant that he will receive the full productivity resulting from his expenditure even though the farm and the landlord's as well as his own income, could be maximized by making the investment. Quite the contrary, the law states under the "fixtures" concept that the landlord gets the $700 benefits after the first year as well as $150 of the first year's returns assuming the tenant leaves the farm after the first year. Thus, certain benefits (namely $850) have become dissociated from the costs and the tenant is obstructed from making the investment even though this investment is necessary to achieve the "equilibrium of maximization" from economic and legal viewpoints.

The remedies for this problem, as frequently formulated in the literature, necessitate legal changes. Either the lease period must be extended to assure a more perfect association between benefits and costs, or the tenant must be assured of receiving compensation from the unrealized benefits when he quits the farm, or the landlord must make the investment and alter his share of the benefits accordingly. The important point is that unless these adjustments are made the farm-firm will not achieve its economic maximum. Thus, economics specifies certain objectives but must rely upon legal changes to help bring the economic objective to fruition. Unless the law complements the economics in this regard the economic analysis comes to naught. The mere fact that it is economically desirable to carry out a certain course of action does not bring about the act. The legal structure within which the action is operative is necessarily an integral part of the economic analysis just as the economic structure of the firm is necessarily an integral part of the legal analysis. Neither is independent of the other; both are essential. This is an example of the nature of economics and law interdisciplinary inquiry. Neither economics

nor law can ignore or assume away the role of the other without losing relevance to the problem that each pretends to solve.

In the example of interfirm dissociation, let us take a watershed made up of say, five farms (firms). Let us assume the maximum net benefits to the watershed necessitates an immediate investment of $100 which yields an expected benefit of $200 discounted to a present value. However, all the investment must be made on Farm A with benefits distributed as follows; $40 to A, $60 to B, $40 to C, $30 to E, and $30 to F. From the watershed viewpoint, the investment of $100 is the best alternative use of such funds. However, Farmer A would not be interested in investing $100 from which he receives only $40. The benefits, at least $160 of them, have been dissociated from the costs and this dissociation prevents the improvement and consequently the maximization. Property lines are the cause of this dissociation since at the watershed level the investment may be warranted because all benefits and costs would be perfectly associated. Consequently, legal means must be discovered or developed that will bring about an association of benefits with costs not only at the watershed level but also for each participating firm, as a prerequisite for making and maintaining the improvement.

Here again, the objective of maximization (at the watershed level) will not be achieved until and unless legal means are provided for benefit-cost association. Economics can determine the maximization norm and the economic conditions for its achievement including the distribution of costs and benefits among the participating firms. However, results of this analysis will be futile unless associated legal means for implementing the economic results by providing stability and order in an interfirm organization are brought into the analysis. Analysis of alternative legal measures require the application of economic analysis in meeting the maximization, distribution and stability objectives. Both analyses are essential; neither can assume away or ignore the other. This is another example of the nature of law and economics interdisciplinary inquiry.

In the example of public and private association, let us take a river basin wherein benefits to the entire basin would be maximized at the point where a $100 outlay would return $300 of estimated benefits reduced to a present value. This investment would be determined through economic analysis by selecting the most economic alternative means and by carrying the investment to the point where the marginal cost equals the marginal benefit resulting therefrom. As in the watershed example, the $100 of neecssary outlay may be invested on land owned by people who would not receive any benefit, or receive a benefit less than their outlay. Consequently, benefits would be dissociated from the costs since the people on whose land the improvements were made could not ex-

pect to share in the benefits that lodged on other people's property. Thus, interspatial dissociation (in terms of property tracts) occurs as was the case in the watershed example. Also, intertemporal dissociation may arise since the optimum planning period of society would be expected to be longer than the planning periods of private economic units.

In the river basin example, unlike the watershed, the benefits are likely to be so dispersed over time (intertemporally) and over property (interspatially) that their identification with particular firms would be prohibitive in administrative costs or impossible of assignment. Furthermore, some of the benefits arising from certain associated purposes such as recreation might be more difficult to evaluate in cardinal terms as was the case in the watershed. However, assuming society is interested in using its limited funds for purposes and projects of greatest relative value in satisfying people's wants, economic criteria are needed to provide the nature and magnitude of the outlay. Also, legal means provide the *modus operandi* whereby the development is organized, managed and maintained. Consequently, economic and legal analysis should be conducted in an integrated manner, for the same reasons advanced in the two preceding examples.

VII

In conclusion, it becomes obvious that law and economics are highly intertwined in the analysis and solution of many land use problems. Economics must articulate economic ends-in-view and the conditions necessary for their achievement. These ends-in-view have been presented as production, distribution and stability and should be accommodated in the law insofar as there are no conflicts with other objectives that the law also must include. The law provides important potential means whereby economic ends-in-view may be achieved in keeping with the attainment of other ends consistent with the wants and desires of people.

In the process of developing legal-economic research, we need to ascertain how the law affects and is affected by human behavior in making and carrying out economic decisions. Such information cannot come solely from law libraries of settled cases of conflicts. It must embrace the legal motivations that never reached a court or for that matter, never reached a stage of open conflict. We also need to relax the rigid assumptions upon which current economic analysis rests. Legal elements of the environment within which economic decisions are made and effected must be considered as variables that may be altered. These changes may best be analyzed by legal students and students of economics working in cooperation with each other. Such changes come about slowly in our system of government. But research is necessary to give both impetus

and direction to the change. Through research, law and economics will find many of the same events to be significant. In the words of Huntington Cairns, "When the sciences have exhausted the nature of the reality they have pre-empted, their conclusions, it is presupposed, will add to a coherent totality in which each science will have its allotted space. The case, however, is otherwise; the fields the sciences study are historically fortuitous in their limits. They are arbitrary and they overlap. At the same time their movement is convergent, since ultimately, as science becomes more fundamental, the different branches find the same events to be significant."[28]

In analyzing the same significant events, law and economics must be fitted into an integrated model embracing both economic and legal aspects of the problems studied. The development of such a model cannot be accomplished in a brief paper such as this. Integration must come about through the intellectual exchange of ideas between students of economics and of law respectively, working together in finding the same events to be significant. This will, I believe, ensue in the interdisciplinary research programs going forward at Wisconsin, Minnesota, Agricultural Research Service, Virginia, Iowa and other institutions of inquiry. In the process, both economic analysis and legal analysis will undergo some necessary fundamental changes. These changes will bring new life into each discipline and aid mankind in working out solutions to the pressing problems before us.

[28] *Op. cit.*, p. 391.

MAKING LAND LAWS SERVE ECONOMIC ENDS

J. H. Beuscher
University of Wisconsin

WE ARE inclined to think of the relation between law and economics in abstract and pretty general terms. I have, for example, at other times and places urged that there is a kind of biological mutualism between law and economics; each giving form and life to the other. Such a general and relatively abstract approach has value and we need continuing, careful analysis of the complex, intermeshing relationships between economics and law, and of the roles of each in our society.

But today I intend to talk on a pragmatic level—to say some simple and obvious things that seem to me to bear underlining because, in our efforts at more abstruse and grandious analysis, we are prone to forget them.

There is, however, one generalization that is important to the specific points I will try to make.

Law makers since the end of the 19th century have shifted their points of view. They no longer conceive their sole role to be the protection of individual property and contract rights. Even before the New Deal, there was evidence of an increasing sensitivity for social and economic consequences of legal rules by judges, legislators and certainly by administrators.

Think of the spite fence cases. Here were American courts, less than 50 years ago, abjectly saying they were powerless, in the face of claims of absolute property rights, to do anything about a high, grotesquely painted fence built out of malice on a lot line for no purpose in the world other than to make life miserable for a neighbor. Legislatures in several states had to pass corrective legislation. Today every American in this room senses that American judges would pull the spite fence down, letting the social interest predominate over the claimed absolute rights of the fence builder.

Or think of the infamous case of *Huber* v. *Merkel*[1] decided in 1903 by an otherwise excellent Wisconsin court. A statute requiring the capping of artesian wells was declared unconstitutional and Mr. Merkel was permitted to flow his well out of pure malice in order to damage his hated neighbors. The court said he "had a clear right at common law, resulting from his ownership of land, to sink a well thereon, and use the water there from as he chose, or allow it to flow away, regardless of the effect of such use upon his neighbors' wells, and . . . such right is not affected by malicious intent."

[1] Huber v. Merkel, 117 Wis. 355, 94 N.W. 354 (1903).

The amazement of my students as I report this case to them in the middle of the 20th century is in itself a measure of how far we have come in fifty years in recognizing social interests in private litigation.

The enactment of mountains of rules by legislators and administrative agencies, regulating property, business, land use, social welfare and contractual arrangements is familiar to all, as is judicial validation of most of this legislation. We have come far since the days of Mr. Justice Sutherland.

But, law makers have not been equally receptive to nonlegal, socio-economic considerations across the board in all fields of law. The most sensitive areas have perhaps been antitrust regulation and labor law. It is commonly assumed that land law is the least sensitive. But as one looks down into the vast potpourri of rules that constitutes the land law of 48 dissimilar states, he finds areas in which law makers and interpreters have been much influenced by socio-economic considerations. Consider, for example, land use controls for reconditioning housing and for zoning and subdivision regulation, oil and gas conservation measures and an amazing chain of recent cases sustaining urban redevelopment and slum clearance measures.

On the other hand, the social interest in matters of inheritance, land transfer, land credit, landlord-tenant relationships and restrictive covenants has not received sufficient attention and weight from law makers.

And in one area of the law, at least, a long recognized social interest, that of free and safe passage on the highway, has been drowned under a deluge of cases announcing and protecting private rights of access and of view. We have not yet sufficiently protected highway users from roadside abuses in this age of high compression engines, high speed and high-highway accident tolls.

But in general we are, on an uneven and irregular front, breaking out of the self-contained and self-sufficient legal sphere within which 19th century legal scholarship worked. The day when the sole task of the legal scholar was logical classification and comparison of legal rules is—offer thanks—past. Now we poke around into real life facts making law-in-action investigations to determine how black letter rules in the books actually operate in a going society. Glenn Coates' study of chattel secured farm credit; August Eckhardt's work on farm transfer and operating arrangements; Margo Melli's study of the actual operation of Wisconsin land subdivision regulations; Robert Skilton's investigation of inventory financing, and Erling Solberg's study of land use controls in a forested county are illustrations.

But the findings of such investigations and dozens more being carried on by agricultural and land economists need to be communicated to our

law makers. The problem of how this is to be accomplished is one of first magnitude. Social scientists are increasingly making findings that are important to the development and administration of our land law. Law makers are increasingly receptive to this kind of information. How can we perfect the lines of communication between the two?

Let me try to come up with some suggestions by turning now to my assignment, which is no less than to attempt to state some *guiding principles by which land laws can be made to serve economic ends.*

The first guide will permit me to deal more in detail with the problem of communication just alluded to. It is this:

(1) understand what the law maker doesn't know;
(2) collect the information and evolve the policy suggestions he needs;
(3) understand the means of informing him; and
(4) inform him.

Basic here is a simple-minded assumption. *People make laws, abstract economic forces do not.* Nor do social or political forces. Obviously, such forces influence people who make laws. But it is the force as understood by the law maker that influences and this may be quite different from the force as understood by the expert. This means that an uncommunicated or misunderstood economic end (policy suggestion) may have no influence on the law maker or it may influence him in exactly the wrong direction.

Let me be more specific. I regard as law makers in our society at least the following: judges; national, state and local legislators; administrators who exercise rule making or interpretative powers; and practicing lawyers! (From some points of view business executives and directors and house counsel for large corporations are also law makers, but I leave them out of this discussion.)

Practicing lawyers are included because, particularly in the field of land law, they in a very specific and important sense make law for their clients. The vital role played by the rural lawyers is not sufficiently appreciated by agricultural economists. He is the one who sets the local standards for marketability of title; who advises on operating arrangements between co-heirs; who overrules the agricultural economist and discourages father-son partnerships; who is increasingly active in drawing farm leases; who plays a key role in planning the transfer of the farm from one generation to the next; who recommends the use of a land contract instead of the mortgage; who presumes to advise the community when zoning is under discussion. He is a critical link in adapting land laws to economic ends. To get land laws to serve economic ends, keep the rural lawyer in mind, penetrate the sheepskin curtain around his law library and acquaint him with the economic consequences of the alternative choices he daily faces for clients. Keep him in mind when distribut-

ing agricultural research bulletins. Help broaden his training by collaborative work with law schools in your state. Consider preparing extension materials aimed particularly at the bar. We have a manual on estate planning for farmers in preparation at the moment at our rural Wisconsin lawyers. There should be more such manuals.

Most of the proposed regional research outlined last April by our North Central subcommittee on legal aspects of land tenure is important to practicing lawyers as law makers and I hope we will report research results directly to them in language and form familiar to them. Lawyers and economists need to work together on topics like these:

(1) Farm transfer and operating arrangement.
(2) Taxation and regulation of the farming business.
(3) Security arrangements for farm credit—a sweeping new commercial code with important implications for farming is being urged in the states for adoption quite unnoticed by agricultural economists.
(4) Organization for the farming business, problems of the farming partnership, corporation and joint enterprise.
(5) Legal-economic aspects of landlord-tenant and other tenurial relationships.
(6) Legal-economic problems arising from nonfarm living in the open country.
(7) Economic-legal problems of parcelling farm land.
(8) Important and difficult problems of valuation of farm land on eminent domain taking particularly for highway purposes.

Let me shift now from practicing lawyers to judges. Much of our land law is case law, not codified into legislation. I want to talk about aspects of the case law process later. Here I have time only for a brief reference to the crudity of the judicial process when it comes to the problem of communicating economic data and desired economic ends to judges. How does one acquaint the judge with current findings and recommendations about the agricultural crop-share lease? How does one get into the record the latest word about estate planning for farmers? How do findings about the impact of urbanization of the rural countryside get communicated to the court?

In general, we still rely upon trial by battle between partisan experts. The court-appointed expert[2] is still pretty much confined to juvenile and public welfare cases and criminal cases where insanity is in issue. Courts, unlike administrative agencies, do not have staffs of researching specialists, though the bright young law clerks in the U. S. Supreme Court and in some state and lower federal courts are in part meeting this deficiency, offering hope for improved staffing for the future.

[2] See J. H. Beuscher, Use of Experts by the Courts, 54 Harv. L. Rev. 1105 (1941).

The principle device by which to get economic data into the court record, other than through the partisan expert, is judicial notice.

Courts can, and often do, judicially notice economic information published in official publications and in standard and recognized works. This is the technical basis on which material in a Brandeis-type brief is accepted by a court.

Experts disguised as referees or masters are sometimes used as fact finders by courts. This has been especially true of proceedings to register land titles under systems comparable with the Torrens system. And in corporate reorganization proceedings there has been some experimentation with the use of a specializing administrative agency (the SEC) to act as fact finding master for the court.

But in general in our judicial process there are only the crude beginnings of effective machinery for informing law-making judges of economic facts and ends. Until such machinery has evolved, economists who wish to influence the course of case-made land law, like the law of waste, of land-contract foreclosure, of agricultural fixtures, of farm leasing, share cropping, partition among heirs, of restrictive covenants, of accounting between co-heirs, etc., must have an understanding of the present system, its limitations and ways around them.

A quick word is added about communicating economic data, findings and recommendations to legislators. No one seems ever to have bothered to look into the economic preconceptions of our legislators. As a matter of fact, very little has been done to investigate the economic attitudes of those who elect the legislator. Robert Winslow Jones', *Life, Liberty and Property,* reporting as it does on class attitudes toward corporate property, is the rare exception. We need a Parrington to report the economic ideas held by various classes of our citizens, good, bad, and terrible.

But in the meantime the growth in some of our states of interim legislative councils offers a unique opportunity, in the land law as in other fields, to bring economic findings to bear on legislative problems. Our Wisconsin legislative council through an advisory committee has, for example, just completed an elaborate study of the state's land subdivision laws, resulting in a rewriting of our statutes on the subject. Now the council has a mandate from the legislature to study real property laws and we are hoping to interest land economists as well as lawyers in the project. For some years economists at the university have been working with the council on tax problems.

Regular legislative committees of the typical state legislature sometimes welcome outside aid in dealing with a difficult subject, particularly taxes, conservation of resources and land use controls. Economists can be of considerable help and influence in preparing proposed reports for such

committees. Needless to say, considerable patience and tact are required, but in return the economist is apt to learn a lot about the difference between economic theory in the books and economic misconception in action.

The same can be said for close collaboration between college economists and policy makers in state administrative agencies. How close a liaison exists between your college department and your state department of agriculture and marketing?

I do not have time to any more than mention the improvement of committee machinery at the federal legislative level, and the important work of Library of Congress economics specialists for Congress. There is no reason why the impact economists are having upon federal legislation should not be extended to state legislatures where, after all, most of our statutory land law gets made.

But let me hasten on to my *second general guide.* It is this:

Adapting land law to economic ends subsumes effective administration of laws to these ends. Paper rules may seem perfectly adapted to economic goals, but poor or nonexistent administration may veto them.

Here we are talking not about court-made case law, but about land use legislation. Administration of such laws directly affects individual incomes. It must be carried out in an atmosphere charged with emotionally explosive slogans about a man's right to do with his own land as he pleases. The subject of administration of land use controls by courts, and by state and local officials is too complicated for even outline treatment here. But one vital point at least must be made. And this point brings us again to the matter of communication. To get effective regulation, landowners must understand and approve of the "economic ends" of the regulation. From this root of popular understanding and support will come community attitudes, which are far more effective for the law's administration than legal sanctions. By popular demand stingy rural governments will hire efficient administrators. Citizens will act as watchdogs to see to it that administration is kept efficient.

In April 1952, two Wisconsin counties adopted zoning ordinances. The first ordinance was the product of five and a half years of intensive work at the town meeting level by the assistant county agent. The second ordinance was a "quicky" based on a state planning board study of short duration and on one public hearing in the county court house. I hope before too long that we can check on the attitudes of people toward zoning in the two counties. It should be enlightening.

Illustrations of what lethargy of the people means to administration of land laws are legion. Probably part of the reason for the lack of success of the Torrens system in most of the 19 states that have enacted it is

popular confusion about it engendered by effective dust throwing and smoke screening by those who have a vested interest in the established recording system. Land economists (and lawyers for that matter) have done little to dispel confusion and to get popular support. Contrast what has happened in Minneapolis where father and son Patton have intelligently preached Torrens' advantages for years and have just as intelligently administered the law. Today, I am told, about 30 per cent of the land in Hennepin County is registered under the Torrens system.

In the zoning field, I hear of county ordinances that can't be found, much less administered by the county clerk; subdivision controls that are ignored or resented; septic tank installation laws that are not only hopelessly behind the times, but also so loosely administered that the threat of epidemic in some urban neighborhoods is immediate.

Prof. J. B. Kohlmeyer's technique in Tippecanoe County, Indiana, of enlisting hundreds of people to help make a simple land use survey as a preliminary to county zoning is suggestive to those who wish effectively to regulate land use for economic ends.

The role of the expert and the role of local democracy in regulating the use of land must be worked out on a trial and error basis, and not every community will come up with the same answer. But this is clear: We must greatly improve our techniques for communicating with the people who are to be regulated. Popular, simply written zoning bulletins with lots of graphics, like that of Utah County, Utah, are needed. So is much more attention by land economists to land subdivision, santitation, tax, and school problems in rapidly urbanizing spots in the open countryside and a communicating of findings through extension meetings and adult discussion groups. Also needed are (1) a recognition that some problems, like those of roadside protection and floodplain zoning, for instance, transcend local boundary lines, and (2) frank discussions with people at the local level of why this is so.

I turn now to my *third guide.* It is this:

There is much more flexibility in our legal system than is ordinarily realized. These elements of flexibility in the hands of one who understands them can be used within a relatively wide range of choice to "adapt" land laws to economic ends.

I will talk about three elements of flexibility:

(1) The manipulative possibilities within our case law process;

(2) The adaptability of contracts, trusts and wills; and

(3) Varying local patterns of rules of law in action.

There is so much here that I can give only a brief outline of points. In submitting this outline I hope to arouse your interest in the law's flexibility and adaptability.

The Case Law Process

Much of our land law is based on court-made case law, for example, the law of waste; of nuisance; of duties of landlords and tenants where the lease is silent; of agency, important for managed farms; of land contract rights and remedies; of possessory rights of mortgage debtors; of restrictive covenants; of joint tenancy and tenancy in common. Dependent on case-made rules are many relational arrangements crucial to agriculture. How does the case law process work?

Actually one must live with it and work with it intimately to understand its manipulative possibilities. First of all, the process is haphazard. Only those cases that happen to get brought, get decided. Because of this, the economist who hopes to influence the development of case law must carefully watch for the "right" cases. Then the brief *amicus curiae* filled with data that passes muster under the doctrine of judicial notice may be a most effective device.

In deciding, the judge may have a choice among several overlapping or conflicting black letter rules. True, one case law rule says that the landowner may fight surface water as a common enemy. But another says he may not create a nuisance on his land with respect to his neighbors. A carefully prepared Brandeis-type brief may well influence the choice in the direction of that case rule best adapted to economic ends.

The art of case law consists also of "distinguishing" precedent cases. And here economic data to show that the current case is not like the precedent case are often vital.

Sometimes courts by dint of socio-economic data can be prevailed upon to declare an exception to the doctrine of *stare decisis* and to overrule a precedent. Thus, because of an *amicus curiae* brief the Wisconsin Supreme Court recently did a right-about-face in holding on rehearing that commercial value of land along the old road need not be included in eminent domain damages on taking land for a relocated, and limited access highway.

Adaptability of Contracts, Trusts and Wills

The limits of what can be done to accomplish land policies through the device of contract are exceedingly broad. Some experiment station bulletins on father-son farming arrangements leave the impression that the contract form in the appendix marks the limits of such an arrangement. Nothing could be less true. In general, father and son, or other contract parties for that matter, can contract as they please so long as moral standards are not violated and so long as the power to transfer the land is not unduly restricted. Conservation clauses in life insurance company farm mortgages, leases and land contracts; private zoning through restrictive

covenants; regulation through contract in selling rights in public lands; FHA farm and home plans contractually agreed to; suggest the wide range of the contract tool to adapt land laws, to economic ends.

Case made or even statutory rules may often be contracted around, a practice familiar in the farm lease.

The trust has been used for centuries to accomplish "estate planning" for families. Its use today is pretty much confined to city families. In appropriate cases, it offers a flexible way of accomplishing desired economic goals for farm families. Agricultural economists should begin giving it some attention.

The will is a more familiar device for the accomplishment of economic goals. In many of our states the power to dispose of land by will is subject to only one exception, that of the married man who cannot by will cut off his wife's guaranteed widow's rights. The landowner can cut off his children; reduce the shares of some, increase the shares of others; control farming methods after his death; prevent the parcelling of the land—all through his will. Such possibilities also merit more study than they have received by agricultural economists.

Varying Local Patterns of the Same Rule of Law in Action

Sometimes economists erect a mental stereotype of a static rule of law that is the same everywhere and is in its operations as certain and inflexible as those highly publicized inflexible laws of the Medes and the Persians. This is dangerous and misleading.

Land laws vary greatly among our 48 states. It cost Home Owners Loan Corporation, on the average, $12.50 to foreclose a real estate mortgage in Texas and took 10 days; but the cost in Illinois was $349.50, on the average, and more that 19 months were required to complete foreclosure. Know what your state rule is supposed to be. Don't assume a "national" law of the recording system, of land contracts, of mortgages, or of anything else in the land law field. Rules of land law are rigorously local in their approach to land problems.

But even within a single state, you will often find substantially different local patterns as you compare the operation of the same rule of law in several counties. The rule of law is that a seller must deliver to buyer a deed conveying "marketable" title. But what passes for marketable title in Sheboygan, Wisconsin, wouldn't pass at all in Madison. "Ownership," it develops, is dependent on a complex maze of facts going back many years, not upon a nickle-in-the-slot rule of law. Who is "owner" of marketable title in Sheboygan County depends on how practicing lawyers there evaluate these facts.

The rule of law is that on death of a joint tenant, the survivor takes all.

But when is property owned in joint tenancy? Ah, this is a question of intention—in short of fact. And so, if the farm land is clearly held in joint tenancy, some of our Wisconsin county judges "presume" that the parties intended to own all the farm personality that way too. Other judges say no, unless clear proof of an actual intention is made, the personality will be treated as solely owned, not as jointly owned, and will pass to all the heirs where there is no will.

Glenn Coates found differing interpretations given to Wisconsin's chattel security laws by farm lenders in various parts of the state and, based in part thereon, found varying lending practices. Margo Melli found no agreement among county registers of deeds about the requirements that had to be fulfilled before a subdivision plat could be recorded.

And so, because many land law concepts like ownership, possession, marketable title and adverse use, are fed fundamentally by facts, and because laws to be applied must be interpreted, do not expect consistency from one county to the next. This very diversity offers laboratory opportunities to agricultural economists. Which local practice or interpretation seems to come closest to meeting economic policy goals? That practice or interpretation that seems "best" can then be urged upon people in other areas.

As Mr. Justice Holmes once put it in his usual crisp way, "Certainty generally is illusion and repose is not the destiny of man." And particularly not, I may add, of agricultural economists trying to adapt land laws to economic ends.

All of what I have said leads to a concluding point. *We greatly need more teamwork between lawyers and economists, both in conducting empirical research and in implementing the findings of that research.* The lawyers on the team will usually be law teachers; the economists will also be teachers. In various states, Florida, Virginia, Minnesota, Iowa, Georgia, Wisconsin collaborative work between law teachers and agricultural economists has started. From my own experience I know it will be fruitful for the lawyers involved. The most stimulating years of my professional life are those that I have spent working with Professors Penn, Parsons, Loomer, Raup, McNall and others of our College of Agriculture.

I think this collaboration in the states just mentioned is also proving fruitful for the economists. Some economists you know are prone to evolve economic principles for an unreal economy, devoid of legal rules. A lawyer coworker will soon disabuse him of that tendency. The lawyer will insist on studying the particular "contract" in each landlord-tenant, buyer-seller, creditor-debtor or other relational situation, expecting to find variations in each case from every other case. He will resist a tendency toward stereotyping such relational arrangements and toward group-

ing dissimilar cases. He will suggest new facets to research proposals. He will be unawed by high sounding legal shibboleths and will go right on insisting that the facts are what count when it comes to questions like (1) who owns the land; (2) was there a partnership; (3) was an absolute deed really a mortgage in disguise and (4) is the land use regulation constitutional. You will find him a valuable research partner.

On the side of implementing research findings he will be invaluable. He will know about the mysteries of judicial notice; how to write a Brandeis brief; how to communicate with practicing lawyers; how to deal with legislative councils and committees and with administrative lawmakers.

Why not try him out?

DISCUSSION: INTEGRATION OF RESEARCH IN LAW AND ECONOMICS AS APPLIED TO AGRICULTURE

DON KANEL
University of Nebraska

The paper given by Professor Timmons is an excellent statement reminding agricultural economists of the legal framework within which implications of income maximizing behavior can be analyzed. Without the legal framework, income can be maximized by force, by fraud, or by encroachment on public resources. It is because of the effort of public officials to eliminate these antisocial motives that the attempts to maximize income could possibly act as the "invisible hand" on behalf of society. But since the law does channel economic choices into certain permissive areas, the further question is raised by Professor Timmons whether or not the presently available choices achieve an efficient allocation of resources, and whether or not some new legal alternatives might increase efficiency or promote other goals of society. The study of this question as a problem is applicable to landlord-tenant relations, to agriculutral credit, to local contributions in watershed development, and so on.

One of the examples that Professor Timmons develops in order to illustrate legal changes more conducive to efficiency is that of a typical landlord-tenant situation. In this case it is assumed that the landlord-tenant firm would benefit from an investment of $500 in terraces yielding $1,000 in returns over a period of six years. The factors impeding investment by the tenant are the short one-year lease and the crop-share provision that gives him only one half of the increase in production, while the landlord's incentive for investment is similarly discouraged because he too receives but one half of the increase in production. Improvement in efficiency calls for a change in lease terms, but it does not call for a legal change as Professor Timmons maintains. The landlord and the tenant are free to enter an alternative leasing arrangement that can provide for payments to the tenant for unexhausted improvement, or for a cash payment to the landlord for the rental value of the improvement, or for any desired changes in the shares of the lease. The landlord and tenant are not only free to enter into other arrangements but presumably they have eco-

nomic incentives to do so. The proposal for a legal change assuring the tenant of the value of unexhausted improvements on investments made by him would be relevant only in the case of an overriding public interest in enforcing such a provision. The public interest may be in the increase in efficiency of agricultural production or in strengthening the weaker bargaining power of the tenants. A similar argument would apply to Professor Timmons' example of a watershed program benefiting five separate farms. In that case also the parties are free to enter an agreement that will equitably divide the cost of the investment, or a case needs to be made for the public interest in having the investment made.

On the basis of these considerations it seems to me that the following problem areas can be distinguished in which integrated research in law and economics would be applicable:

(1) Research in alternative voluntary arrangements between two or more parties whether landlords and tenants, or creditors and borrowers, or contracts between processors and farmers as in canning crops, etc. Research in economics and law could concern itself with the incentives provided by these arrangements to the participants. Incentives would have to be taken broadly to mean the profitability of putting out effort and making investments, and the division of different types of risks and responsibilities, including the rights of the parties in the event of dissolution of the agreement. Research of this type is concerned with making clear the fuller consequences of alternative arrangements and thus should contribute toward sounder choices.

(2) Research on proposed legislation providing new legal arrangements into which private individuals could enter voluntarily. An example of this would be the adoption by the states of the Uniform Commercial Code for chattel-secured farm credit which is discussed in a recent study by Coates.[1] This would make production credit better adapted to the requirements of the production process in agriculture. Research concerned with this would be similar to that discussed above.

(3) Research on legal restraints on private conduct. An example of this would be a zoning regulation or the legal requirement for payment for unexhausted improvements to be made to the tenant. Again legal and economic analysis would be needed on the alternatives created by the proposed legislation and on the behavior that would be evoked by these alternatives. However, research in this area would also have to analyze why there is a public interest in restraining private action.

(4) Research on public responsibility for providing certain services whether that of furnishing Soil Conservation Service technicians, or the administration of public resources by the Forest Service or the Tennessee Valley Authority. This is the area of appraising alternative public resource development programs and their complex relations to private rights. Here again the importance of analyzing the public interest is paramount.

Professor Timmons proposes two types of research methods. One approach would use the concepts of the theory of allocation of resources. These concepts can be used to derive the conditions necessary to provide those incentives for income maximizing individuals that will promote efficiency according

[1] Glenn R. Coates, *Law and Practice in Chattel Secured Farm Credit*, Madison, Wisconsin: University of Wisconsin Press, 1954.

to its definition by welfare economics. These concepts can also be used to analyze the behavior in response to alternatives now permitted within the law, and to alternatives that would be created by suggested changes in the law. The other approach would be "legal inquiry into the law-in-action area to determine how the law in actual practice motivates and limits human behavior in making economic decisions." I concur with Professor Timmons that the two approaches complement each other, and their joint use will make a contribution to the analysis of legal and economic problems. It seems to me, however, that some additional points can be made about the relation of these two approaches.

Let us return to the example of the landlord-tenant arrangement in which it would be efficient to make a $500 investment in terraces. Further, let us assume that a state legislature is willing to pass legislation giving the tenant a right to the unexhausted value of improvements made by him on his landlord's farm. This legislation will have to determine the rights in the land and improvements of the landlord, of the tenant, of the purchaser of the land, of a creditor holding a mortgage on this land, of a future tenant other than the one making the improvement, as well as the liability of the landlord and the tenant for real estate taxes. Further, the law will have to define whether or not the right of the tenant to improvements depends on the consent of the landlord to the making of the investment, and whether or not the right depends on the circumstances causing the tenant to leave his farm. The law will also have to define whether or not the tenant has recourse to the man who was landlord at the time the investments were made or to the buyer of the land. Thus the rights and duties established by the law would not only affect the incentives of farm tenants to make investments but will influence also the ease with which farms can be sold, the extension of credit, the incentive for different types of prospective landlords to own farms, and so on. Another problem that would have to be considered is whether or not the legislation will lead to many disputes, and how well the courts will be able to untangle the rights of the disputants in court cases.

This example is developed in order to make the point that the need for workable institutions imposes its own requirements on what the legally available alternatives can be, and that these requirements might have to be different from conditions developed by marginal analysis. The concepts of the bargaining, rationing and managerial transactions developed by John R. Commons seem to be relevant at this point.[2] The bargaining transactions refer to decisions in the market made by firms, consumers and owners of resources. These decisions include buying and selling, hiring resources and choosing among alternative investment opportunities. The rationing and managerial transactions refer to decisions within the firms. Once individuals enter a landlord-tenant arrangement, or a creditor-borrower arrangement, then the incidence of profit, risk and uncertainty is divided among them by their agreements and by what the statute law and court precedents read into their agreements. These risks and uncertainties include not only the types commonly considered in economics but also the effect on each party to the arrangement of misconduct by or misfortune to the other party. In other words, these are risks that individuals as-

[2] John R. Commons, *Legal Foundations of Capitalism*, New York: The Macmillan Company, 1924.

sume by being dependent on the actions of other human beings. The working rules used by the courts in deciding disputes and the more informal ways of deciding common problems that develop among participants are rationing and managerial transactions.

This distinction between market decisions and decisions within the firm is introduced as a suggestion for considering some criteria in addition to the marginal conditions when dealing with legal improvements for the sake of efficiency. Commons and his associates used these ideas primarily in analyzing workable rules of procedure in union-management relations, workmen's compensation and other welfare legislation. But a similar concern with workability is relevant to research on improving landlord-tenant relations or introducing new creditor-debtor arrangements in agriculture.

I also want to mention certain aspects of research on public policy because of Professor Timmons' reliance on the concepts of welfare economics as the criteria of the public good. In the welfare economics approach a public problem arises in those cases of dissociation of costs and benefits among individuals in which the individuals do not have any incentive to eliminate the inefficiency. Examples of this would be providing flood control measures, or eliminating factory smoke. The implication of welfare economics is that by public decision resources should be used to satisfy the given wants of individuals. Thus both public policy and market choices are conceived to be governed by the existing wants of the members of society.

Here, it seems to me, there is need to take issue with the concept of given wants. Proposals for a new resource development program, or for new legal definitions of what is permissible action, arise primarily because old patterns of behavior are creating new problems. There is likely to be an absence of agreement on just what goals can and should be achieved, while in opposition to change there are vested interests in the existing state of affairs and adherence to previously established norms for public activity. An example of this is public discussion of alternative price support proposals, each of which is a bundle of effects on prices, controls on producers, and public assumption of responsibility for certain marketing services. In working on a problem like this, research needs to concern itself with tracing through the various consequences of alternative proposals in the complex fabric of society, whether these consequences appear in the allocation of resources or in the security or in the dignity of the people.

The research worker cannot say that he can work out the most efficient public policy, because at the time when he should begin making his contribution the wants and the opportunities are too confused to provide him with a guide. Rather than using efficiency as a criteria for a public program that will satisfy the wants of inactive individuals, research can contribute clearer ideas so that a less confused public can participate in the process of policy formation. That participation consists of thinking through alternatives, discussing them and thereby forming new wants, finally resulting in a more considered public policy. The final solution can be called the most efficient in satisfying the wants that finally emerge at the time of the decision. But this conception will overlook the contribution of research to the formation of new wants and to a more active participation of citizens in public decisions.

I would like to make a few comments on the paper given us by Professor Beuscher. First he reminds us that the law is what the decisions of legislatures,

courts and lawyers say that it is. To this should probably be added the organized groups who formulate specific proposals for legislation and whose political activity is the main stimulus for legislative change. Secondly, Professor Beuscher sees the main contribution of the expert in communicating his analytical insights to those whose decisions determine the law. His extended discussion of the need of the decision makers for expert knowledge is complementary to the suggestion in this comment of the absence of given wants in the making of difficult policy decisions. Lastly, he seems to emphasize what the law can learn from economics, whereas we economists need the advice of the lawyers on methods of analyzing the workability of institutions, such as father-son agreements, leases and credit arrangements that we are prone to propose. I would like to suggest that Professor Beuscher give us his ideas on this subject at some future time.

DISCUSSION: ECONOMIC-LEGAL APPROACH TO AGRICULTURAL PROBLEMS

JOHN C. O'BYRNE
Agricultural Law Center, College of Law
University of Iowa

As I pondered the excellent papers of Professors Timmons and Beuscher, I was pleased that each had concerned himself with different yet related facets of interdisciplinary research. Timmons seeks a philosophical rationale; Beuscher emphasizes a pragmatic approach. Both are essential and both will demand serious consideration over the next few years.

It seems to me that the papers raise three immediate questions: (1) What is the nature of "the law" for land tenure purposes? (2) What is the relationship of law and economics? (3) What is the approach to our research activities?

What is "law"?

How should we categorize this thing we call "law"? Obviously we are not immediately concerned with all law in every land tenure situation. Aspects of the law relating to property, eminent domain, taxation, inheritance, credit, landlord-tenant, etc., are clearly of immediate concern and impact. It is easy to argue that almost any phase of law can effect tenure problems. Criminal law, family law, procedure, torts, antitrust, etc., could have an effect, more or less, depending upon the particular problem. But these are more remote and we are supposedly talking about "land law." In setting our frame of reference, let us recognize that "land law" or tenure has a far broader meaning to the agricultural economist than to the lawyer. It is much more than the lawyers "property law" but still only a part of the totality of "the law."

Law is an all pervading part of our social structure. At virtually every moment we are in some way subject to a legal valuation. Yet what is it? We personify and speak of "the law." If we mean the aggregate of all the rules and cases, the thoughts of lawyers, and the operations of the various forms of legal machinery—a shorthand phrase and no more—we are all right. If, however, we are thinking of an abstract set of rules, far, distant and immutable that facilitates or obstructs achievement of our goals, we are lost. We must think in terms of the human

beings who legislate, administer, judge or advise if the law is to have meaning in its everyday operation. It is the lawyer's complaint about his economist friends that they fail to see the practical reality of the legal system.

There seems to be an assumption that there is an acceptable philosophy that establishes an orderly system of law and human conduct in terms of which our problems can be explained or reordered. Let me not appear to decry the philosophy of law nor the study of jurisprudence. Let us continue to seek a pattern, an explanation of "the law," but be not too sanguine about finding it readily.

We have been told by Plato that law is a form of social control, an instrument of the good life, the way of the discovery of reality, the true reality of the social structure; by Aristotle that it is a rule of conduct, a conduct, an ideal of reason, a rule of decision, a form of order; by Cicero that it is the agreement of reason and nature, the distinction between the just and the unjust, a command or prohibition; by Aquinas that it is an ordinance of reason for the common good, made by him who has care of the community, and promulgated; by Bacon that certainty is the prime necessity of law; by Hobbes that law is the command of the sovereign; by Spinoza that it is a plan of life; by Leibniz that its character is determined by the structure of society; by Locke that it is a norm established by the commonwealth; by Hume that it is a body of precepts; by Kant that it is a harmonizing of wills by means of universal rules in the interests of freedom; by Fichte that it is a relation between human beings; by Hegel that it is an unfolding or realizing of the idea of right.[1]

Nor should the moderns go without mention, Pound, the Cohens, Cairns, Holmes, Frank, Brandeis, and the rest have added their mite. None has succeeded fully; none has achieved full agreement with his colleagues. It is no mark of humility to say that we who talk today are not going to discover, quickly and easily, a philosophical "system." There are ideas in all of them.

Let us at first theorize in limited areas of particular concern. It seems important to examine the type of law that bears upon or should bear upon a particular tenure situation. Some law sets minimum standards (waste); some law simply fixes the area in which men may do as they please (wills); some law comes into play when no other factor is determinative (inheritance); some law establishes simple order (drive to the right); some law is concerned with indemnity (eminent domain); some law is concerned with welfare (social security); some law seeks to lure men to greater things (soil conservation acts); some law is designed to exert economic controls (Federal Reserve Act) and so on. This is obviously not a rationale classification, nor are the items exhaustive or exclusive, but it serves to illustrate the difficulty of explaining all law in an ordered philosophical system.

In seeking an immediate jurisprudential basis for our research, look to the exponents of sociological jurisprudence. The sociological jurist is concerned more with the working of the law than with its absolute content, he regards law as a social institution that can be improved by intelligent effort, he emphasizes social purpose above sanction, and he sees legal institutions, precepts and doctrines functionally, regarding form as a matter of means. Sociological jurists would insist upon study of actual social effects of legal institutions, precepts and doctrines, study of law-in-action, a sociological legal history, and the importance of individual application of legal precepts.

[1] Cairns, *Legal Philosophy from Plato to Hegel*, Johns Hopkins Press, Baltimore (1949) p. 556.

It is the reality of the pragmatic nature of our daily contact with law that must be recognized. In so many of the areas with which we are concerned, law establishes minimum standards not ideals of conduct. It is the difference between "love thy neighbor" and "thou shalt not kill." As you have listened to my colleagues you noticed that Timmons tended to seek the positive ideal written into law. But Beuscher, from his experience with the grass roots looks to the gradual improvement of minimum standards at the basic level and emphasizes the great unrestricted areas in which economic and moral values can be achieved by the parties above and beyond any minimum legal standard.

What is the relationship of economics and law?

More than thirty years ago, December 30, 1924, to be exact, Law Professor Karl Llewellyn told your colleagues of the American Economic Association that lawyers have been turning to economics and economists to law for light on the function and theories of their own profession.[2]

> . . . The jurist is protesting against the dogma of his fathers that law is unchanging, eternal, discoverable always by deduction. Only recently has he come to see it as a thing in flux, and made discovery of non-legal facts which condition its growth and action. Whereas the economist takes that for granted. Law exists. If it serves economic life well, he has ignored it; if ill, he has pithily cursed it and its devotees, without too great effort to understand the reason of disservice. . . .

Llewellyn acknowledged the contributions of economic theory to law. Not in the formulation of systems but in discovering what it does or what it can effect. The concept of scarcity appears in determining how much social energy we have to devote to law enforcement as opposed to improving the social order—"legal engineering," he calls it. The function of supply and demand clearly appears in the allocation of social energy to law enforcement according to the intensity of the felt need for order and according to the adequacy with which other means of community discipline cover the ground. And is not the marginal concept readily ascertainable in law? Our conceptions of legal rules for landlords and tenants or enforcement of contracts are theoretically set at a marginal level of protection or performance. In fact, it is the element of marginal restriction that suggests the breadth of the unrestricted area in which so much can be done, *e.g.* Beuscher's areas of contracts, wills and trusts.

What is the pattern of research?

Let your minds play on the ramifications of the relationship of the lawyer to the economist. Timmons almost says that the lawyer is responsible for achieving the goals the economist has set up. Beuscher offers techniques to get the lawyer to "adapt" the law to economic ends. First, he says, communicate to him economic data and policy suggestions that "he needs." He mentions the opportunities of the economist to "manipulate" the law. Then, he charges the economist to avoid the stereotype, the fixed pattern and to understand the tremendous freedom that exists in contracts, wills and trusts. Do I interpret this to mean that, research-wise, one fishes on one side of the lake, one fishes on the other side, and no one fishes in the center? Where is the joint endeavor, the cooperative project, the sharpening process of mind rubbed against mind,

[2] The Effect of Legal Institutions Upon Economics, 15 Amer. Econ. Rev. 655 (1925).

the understanding, appreciation and tolerance of one another that comes from working in close cooperation. I grant you that it is not easy to yoke the ox and the camel, but shouldn't we try?

There seems to be agreement on the technique of getting underway. Start with the areas in which you can see most clearly, where economic interests clash and the law must adjudicate the clash on the basis of the competing economic interests and the community. Avoid areas of high emotionalism where unreasoned feelings brook no discussion. Work together; develop a cooperative, if not truly joint, research program; mix your students of law and economics.

Find an economist with a bent toward law and an economics minded lawyer or law professor. Let them first learn to understand each other. Let them work together. First study law-in-action at its simplest level. Here Beuscher is your best tutor. Find out why and how law operates and its relation to the economics of the firm or firms immediately concerned.

If I were to summarize my thoughts on the papers, they would run something like this. From Beuscher, I have guides to action. From Timmons, I have guides to further thinking about the relation of law and economics. We seem agreed that "lawmakers" recognize more and more the social interest, that they are beginning to awaken to nonlegal sources of information, that we must stimulate that interest.

I concur with Beuscher in his desires to communicate with lawmakers. But that communication will be difficult until the communicating economist knows more about the nature and function of law, the job of the lawyer, the machinery of the decision-making process, the function of the administrator in carrying out the law, and particularly, as Beuscher points out, how there can be a general "rule of law" that results in different "laws" in each community.

I regret to say this but I think it is true. The impetus for cooperative work has come from the land economists. It must continue thus. Your law school friends and your lawyer friends will respond vigorously, but they will not move first.

The trouble is that law is by nature interdisciplinary, most of its students are not yet.

SUPPLY ANALYSIS

Chairman: Leonard F. Miller, Oklahoma A. and M. College

CONCEPTUALIZING THE SUPPLY RELATION IN AGRICULTURE*†

WILLARD W. COCHRANE
University of Minnesota

I

SERIOUS papers, or research publications, dealing with some aspect of the supply relation in agriculture have not been plentiful over the years; one every three to five years, with perhaps some bunching recently, has been the average over the past 35 years. And only a scant few provide estimates of supply elasticities that most of us would want to use today. This is not a good record. The question is why. Why has there been so little good work in this area?

I have two unrelated answers to this question; there may be others. First, production men, the men with the raw data and a natural claim to this subject area, have not interested themselves in predictive supply relations. They have concerned themselves almost exclusively with normative problems of the firm: the current profit position of the firm and what ought to be done to make it more profitable. Second, the general, or price economists have been lost in the conceptual fog surrounding the supply relation. Conceptual difficulties growing out of length of run, unit of inquiry and definitions have prevented the emergence of a clear and potentially measurable concept of the supply relation in agriculture. Now I do not know what the position of production men generally will be with regard to this type of research over the next few years. But I do know that policy decisions and the growing emphasis on price policy research are going to force some agricultural economists to come up with some reliable and useful estimates of supply relations and elasticities in agriculture over the next several years. And it is my hope that this paper, along with some others that have appeared in the recent past,[1] will help cut through the conceptual difficulties that have bedeviled and befuddled past efforts to estimate supply relations in agriculture.

---

* Miscellaneous Journal Series, No. 900, Minnesota Agricultural Experiment Station.

† The author wishes to acknowledge the useful criticisms and suggestions made by his colleagues, S. A. Engene and Harlan Lampe, of the University of Minnesota. Errors of fact, judgment or logic, are, of course, the responsibility of the author alone.

[1] D. Gale Johnson, "The Supply Function for Agricultural Products," *American Economic Review*, September 1950 and Earl O. Heady, "The Supply of U. S. Farm Products Under Conditions of Full Employment," *American Economic Review*, Papers and Proceedings, May 1955.

It is the specific purpose of this paper then: (1) to sort out and describe the different concepts of supply, (2) to hypothesize the relative elasticities of supply for different commodities and aggregates, and (3) to note and discuss the unique aspects of supply in agriculture. Our method for achieving this threefold purpose will be that of discussing the supply relation in terms of commodities, the firm and the national aggregate. But before we embark upon a discussion of the supply relation for these different units of inquiry, certain definitional, hence conceptual, problems need to be cleared away. We must decide what we mean by supply.

II

The term *supply* and *response* are often used interchangeably in discussions of "supply," but a subtle distinction is sometime made between these terms in the literature of our field: the term *supply* is used to describe a specific type of relation; the term *response* is used to describe a more general, or what Heady has called a mongrel,[2] relation. Certainly the two terms can be used to denote an important conceptual distinction in this area of "supply." And they will be used to denote such a distinction in this paper.

By the term supply relation, or supply function, economists trained in the equilibrium tradition have in mind how the quantity of a product offered for sale varies, as its prices varies relative to other product prices, *for some given time period and for a given state of the arts, or technology.* The concept is used to describe how the quantity of a commodity offered on the market varies by reason of resources flowing into, or out of, the enterprises producing the commodity, as the price of the commodity varies relative to other, substitute, commodities. Implicit to the concept are the notions: (1) that one or more factors may be varied in the production processes involved and (2) that these factors are substitutable among enterprises, firms and industries (i.e., factors can vary in practice where they are technically variable). Explicit is the notion that the concept is net, relating quantity supplied to price, where all other influencing conditions are held constant (for example, technological advance). The concept of supply is a rigorous one: reversible and timeless as regards dated time. It finds a useful and meaningful role in economic analysis in the way of explaining price formation in a *market;* when the rigorous concept of supply is related to an equally rigorous concept of demand an explanation of market price emerges.

By the term response relation, or response curve, economists have in mind, or should have in mind it is argued here, how the quantity of a commodity offered for sale varies with changes in the price of the com-

[2] *Op. cit,* p. 236.

modity. This then is a more general concept; it is, in fact, inclusive of the previous concept of a net supply relation; it is concerned with the output response to a price change by whatever means that response takes place—whether through the employment of more or less resources, the modification of the fixed plant, or through technological advance and under whatever set of conditions may obtain—liquidity position, access to credit, point in time, market information, price certainty, etc. The response relation describes that will happen to the quantity of a commodity offered for sale when we do not hold all other things constant. In a sense it is a study of the shifters of supply. The supply response relation thus finds its greatest use in *predicting* the change in quantity offered for sale associated with some *particular* change in price.

III

The Commodity Supply Relation. It is presumed on the basis of logic and experience that the typical commodity supply relation, or function, in agriculture is positively inclined. In other words, it is presumed that an increase in the price of a product relative to the prices of product substitutes will serve to attract additional units of one or more factors into the production of the product in question. The converse is, of course, presumed for a decrease in the product price. But the *slope* of the commodity supply relation will depend (1) on the time period involved (i.e., how much time operators have to effect factor adjustments), (2) on the existence and extent of production alternatives, and (3) on the closeness of existing production alternatives (i.e., on the difference in factor returns between the enterprise in question and its alternatives). When the length of run involved is long and the alternatives are plentiful and close, a relatively small increase in price will be associated with a relatively large increase in the quantity produced and offered for sale, and conversely. Bearing in mind the conceptual precision which the supply relation entails, *it is not hard to understand why so few empirical supply relations have been constructed;* hence why estimates of elasticity of supply by commodities are so few and far between. The analyst must first find a way to hold technological advance and other influencing factors constant. But second, and of greater complexity, the analyst must know which factors the *decision maker treats as fixed for the period and unit of inquiry under consideration,* find quantitative measures of such fixed factors, and introduce them into his system of estimating equations in a proper fashion. This is no small order, but we do have some estimates that merit some confidence. Robert Walsh in the early 1940's estimated the elasticity of supply for cotton to be about .25 in the short run.[3] From some

[3] *Journal of Farm Economics,* May 1944, pages 359-372.

work done by Pubols and Klaman, the short run supply relation for potatoes may be estimated to have an elasticity of about .4.[4] And recently George Judge has provided estimates of the elasticity of supply for eggs running as high as 1.16.[5]

Using the above estimates as anchoring points, and drawing upon personal experience with regard (1) to the length of run required to effect production adjustment by commodities and (2) to the availability of production alternatives by commodities, we can perhaps say something meaningful with respect to the *relative* supply elasticities for different farm commodities. These judgments with respect to the elasticity of supply should not be interpreted as being correct in an absolute sense; they are presented to indicate the *relative* position of commodities with respect to their short run elasticities of supply.

Commodity	Elasticity of supply
Wheat	.1 to .2
Cotton	.2 to .3
Corn	.2 to .3
Whole milk	.3 to .4
Potatoes	.4 to .8
Beef	.6 to .8
Hogs	.8 to 1.0
Eggs	1.0 to 1.2
Certain individual vegetable crops (e.g., onions, tomatoes, cabbage)	1.0 to 2.0

Before anyone explodes upon reflecting on these suggested elasticities, let it first be recalled that these are supply relations under consideration, not response relations. There is no technological advance involved in these judgments of elasticity. Neither does that phenomenon of animal products prices and feed prices rising and falling together to yield an inelastic response curve, described with some annoyance by Johnson[6] and Heady[7] and discovered with some pleasure by Butz and myself,[8] play any role here. These elasticities describe the suggested nature of the commodity supply relation, where certain elements of the farm plant hold constant, and others vary in response to relative product price changes in the short run.

---

[4] *Farmers' Response to Price in the Production of Potatoes, 1922-41,* Mimeo. release, USDA 1945.

[5] *Econometric Analysis of the Demand and Supply Relationsnips for Eggs,* University of Conn., Agricultural Exp. Sta. Bul. No. 307, January 1954.

[6] *Op. cit.,* page 553.

[7] *Op. cit.,* page 236.

[8] Output Responses of Farm Firms," *Journal of Farm Economics,* November 1951, pp. 463-468.

Since by short run we mean those changes in resource use that occur from one planning period to the next, what changes in resource use can, or typically do, take place in the short run for the commodities considered above?

In the case of wheat, inputs of land, labor and certain forms of machinery and equipment are typically substituted between the wheat enterprise and alternative enterprises in midwest areas where the difference in returns to factors is not great, but are not substituted on the high plains where the return to factors is much greater in wheat than in the next best alternative. The same factor inputs, plus fertilizer, are likely to be substituted between corn and its alternatives and cotton and its alternatives where factors returns admit of such substitution. In the case of whole milk production, feed will be substituted between this enterprise and other animal product enterprises, and cow numbers will be varied on a limited basis. And in the case of egg production, feed will be varied, but more important the number of layers can be and is varied.

But in all of this substitution of resources among enterprises within and between firms, certain elements tend to remain fixed in the short run. It is difficult to think of these fixed elements in terms of a single enterprise, but they do emerge rather clearly in terms of the representative, family farm; and they do impose a constraint over the substitution of resources among enterprises. Those elements tend to be: (1) the size of the family laboring force, (2) the total number of acres per farm, (3) the total amount and form of heavy machinery and equipment, and (4) the capacity and form of farm buildings. These elements limit the technical substitution possibilities among alternative enterprises within and between firms.

If the above judgments with respect to the short run elasticities of supply are reasonably representative, then Heady's statement that "the short-run supply functions for individual farm products have relative high elasticity . . ."[9] is not correct. And neither is the view that a falling price induces an increase in output. In all cases the commodity supply relations in the short run are positively inclined, but the elasticity of supply varies importantly from commodity to commodity: from extremely inelastic for wheat to rather elastic for certain vegetable crops. In the longer run, of course, the estimate of supply elasticity for each commodity noted above should increase.

The Supply Relation for the Firm. The question to be answered here is the following: How do the concept of supply and measures of its elasticity change, as the unit of inquiry changes from that of the commodity to that of the farm firm? Turning first to the concept of supply—the defi-

[9] *Op. cit.*, 220.

nition does not change. The economist is still concerned with describing how the quantity offered for sale varies as price varies relatively, for some given time period and as all other influencing conditions are held constant. But now the concern is with the quantity offered for sale by the firm, not all suppliers of one commodity. And the typical farm firm is a multiple enterprise unit producing several different commodities. Thus, the supply relation for the multiple enterprise firm must describe how the *aggregate* of commodities produced and offered for sale varies as the prices of those commodities vary. In this context, the variable, price, converts into an average, or level, of prices to deal with several prices, and the variable, quantity, converts into an index number of quantity to deal with several different commodities. The concept of a supply relation for the firm is thus complicated by the index number problem, but it is in no wise invalidated. On the contrary it is conceptually possible, and just as important, to describe the supply relation involving the aggregate output of a farm as it is a single commodity relation.

Most economists are in agreement that the short run supply relation for the typical farm firm is severely inelastic. This means that the aggregate output of the farm firm changes very little with a rise or fall in the level of prices for the commodities involved, although, of course, the composition of the aggregate may change importantly. This inelasticity of aggregate output results from a number of interrelated and interacting causes. First, on family farms, family labor, land and many forms of capital are treated as fixed inputs in the short run; in the going concern of the family farm the cost of these inputs does not change appreciably whether they are used or not, hence they are employed fully. Second, in periods of falling product prices, farm labor, land, and sunk capital lack alternatives, hence the return to these resources falls along with product prices, and they continue to be employed on the same farms; in periods of rising products prices land and labor resources cannot be increased on each farm by operators bidding against one another for those resources already employed on farms. And land and labor do not easily flow back and forth across the farm–nonfarm line in response to changing factor prices. Third, farmers tend to view their occupation as a way of life, as well as a business, and do not respond readily to economic stimuli. For all of these reasons the resources of each farm tend to remain fully employed in the short run, hence the total output of each farm varies only modestly with a change in the level of prices (i.e., the supply relation of the firm tends to be severely inelastic).

To illustrate this phenomenon of sustained output, let us visualize the operation of a multiple enterprise family farm involving: corn, hogs, dairy, soybeans and eggs and poultry. Now let the price of soybeans fall

relative to the other commodity prices; in this event the operator will be inclined to reduce his production of soybeans. But the acres taken out of soybeans will not remain idle; they will go into more corn or oats or hay. The increased supply of feed is converted into more eggs, dairy products or hogs, and the total output of the farm measured in terms of a price weighted index holds approximately constant or perhaps declines modestly. Or let the prices of all five products fall proportionately. In this case there will be no shifting of resources among enterprises, but neither will there be a contraction in total output. For the combination of reasons recounted above, the resources of the farm remain fully employed and output is maintained.

The Aggregate Supply Relation for the Nation. The aggregate supply relation for the nation at the farm level is simply the summation of individual firm supply relations. And since the typical supply relation for farm firms is severely inelastic, it must follow that the aggregate supply relation for the nation is severely inelastic. Within the national aggregate, supply adjustments will take place in accord with the commodity supply elasticities noted earlier, but in the over-all and in the short run output is maintained. The aggregate supply of farm products for the nation changes very little if at all with changes in the price level.

This generalization is consistent with information concerning the over-all employment of resources in agriculture. The index of total inputs in agriculture changes only modestly from year to year; during the period 1920 to 1950 the index moves within the narrow range of 100 to 110 and shows no discernible trend. T. W. Schultz summarizes this stability in the use of inputs as follows:[10] "The quantity of inputs committed to farm production from one year to the next is the most stable economic variable in agriculture. It is doubtful that one could find another major variable in the entire economy that is as steady. . . ." The total output of agriculture may vary from other causes, for example, from a serious drought or the widespread adoption of the gasoline engine, but not from a purposive expansion or contraction of total resources employed. Over the years the increased employment of capital has just about offset the decreased employment of labor to hold constant the total inputs committed to agricultural production.

At the retail level the aggregate supply relation may not be so severely inelastic. At very low farm prices some commodities produced and sold at the farm level may not move completely through the expensive marketing system. And wholesalers and other middlemen may effect some intertemporal substitution with respect to supplies, hence give rise to more slope in the aggregate supply relation at retail than at the farm level. At

[10] *The Economic Organization of Agriculture*, page 210.

any event, some preliminary work at the University of Minnesota suggests that the elasticity of the aggregate supply relation for food at retail may approach .3.

IV

The Role of Technological Advance. The role of technological advance on farms has been ignored, or assumed away, to this point in order to conceptualize the various supply relations. But to ignore the role of technological advance, is to ignore the principal way in which the total output of agriculture has expanded since 1900 and the almost exclusive way it has expanded since 1920. Total inputs employed in American agriculture have held almost constant since 1920, but total production has not. Total production has trended upward at a little over one per cent per year since 1920. This rate of increase must be ascribed to technological advance; there is nothing else to which to ascribe it. This inference does not seem unreasonable, however, in light of what we all know has been occurring on farms. Farm operators generally have adopted a wide range of new and improved production methods; improved plant varieties, improved breeds of livestock, improved sanitation practices, the general purpose tractor and endless machine "hookups," new methods of insect and pest control, supplementary irrigation, new views on fertilizer application, improved feeding practices and so on.

The modern farmer rarely adds additional units of the same type of capital; he does not typically vary the proportions of identical units of resources employed; he moves from one resource mix in one planning period, to a new and improved resource mix involving new practices and new technologies in the next planning period. Generally a new resource mix, involving a new and more productive production plan, entails an additional cash outlay to acquire some new capital good, but not always. The key point to bear in mind is that present day farm operators have come to regard the adoption of new and improved production methods as a regular thing; they expect to make such adoptions year after year. Thus, technological advance is the dynamic force in agriculture, being involved in almost all production adjustments and explaining net increase in output on individual farms and in the aggregate.

In terms of the supply relations discussed earlier, commodity and aggregate, this means that those relations have not been holding constant. Under the force of technological advance they have moved to the right in an expanding action. As output per unit of input has increased, the typical farm firm stands ready to offer more products for sale at any particular price; thus we say that the supply curve, by commodities and in the aggregate, has shifted to the right.

It is probably not correct to visualize individual supply relations drifting to the right over the past several decades at an even pace. In the aggregate at least the supply relation has expanded in a hopping or skipping action. This is true because the rate of increase in production efficiency growing out of technological advance has not been steady. Figure 1 makes this clear. Over-all efficiency in agriculture did not increase between 1910 and 1920; the trend line of efficiency held constant over this period. An upward thrust in efficiency does, however, mainfest itself in the period 1921-24. This period is then followed by a long quiescent span of years, 1924-36, with no important gains in efficiency. Finally, that great period of technological advance emerges, 1936-44, with spectacular gains in production efficiency. The economic meaning of these spurts in technological advance, hence production efficiency, must be that the aggregate supply relation, and the majority of commodity supply relations, jumped to the right in expanding action during these spurts. And during periods of little or no gain in productive efficiency, the aggregate supply relation, and many commodity supply relations, must have held quiet in fixed positions.

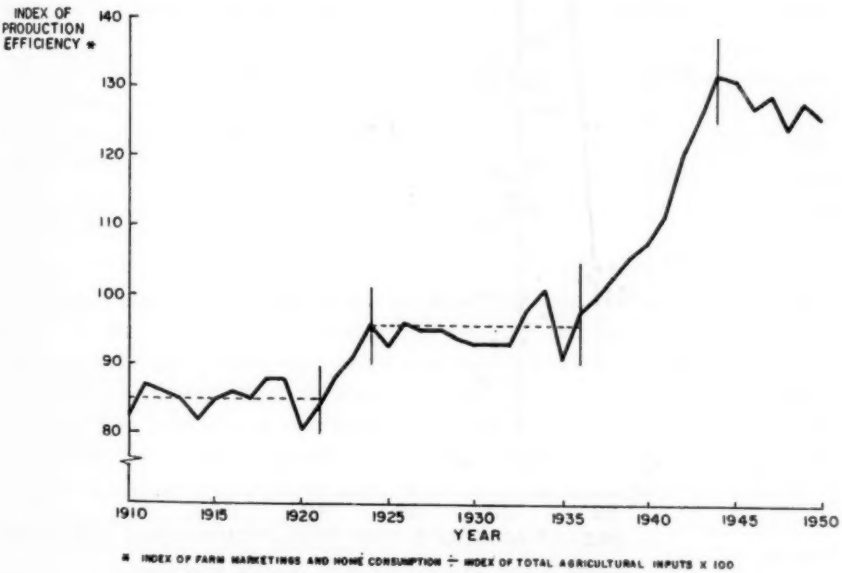


FIG. 1.—CHANGES IN PRODUCTION EFFICIENCY IN AGRICULTURE.

This general view of the relationship of technological advance to the aggregate supply relation is portrayed in Figure 2. In this figure, the aggregate supply relation for food, relating an index of responsible

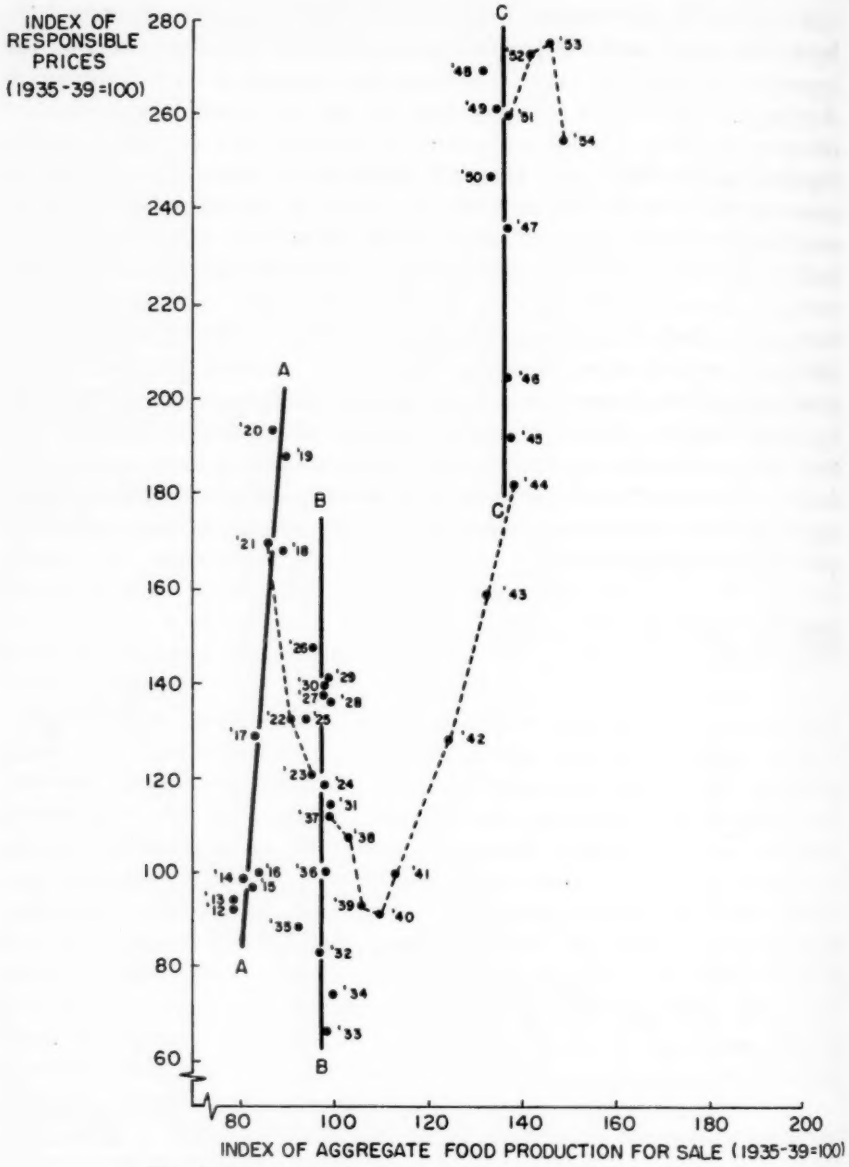


FIG. 2.—THE AGGREGATE SUPPLY RELATION (S) FOR FOOD.

prices[11] to an index of production for sale,[12] emerges for each period of technological quiescence: the AA curve for the period 1910-21, the BB

[11] This index is described in the article, "Farm Price Gyrations—An Aggregative Hypothesis," *Journal of Farm Economics*, May 1947, page 392, footnote 9.

[12] The index of "Farm Marketings and Home Consumption" published regularly by AMS.

curve for the period 1924 to 1936 and the CC curve for the period 1944 to 1951. Thus, we observe that the aggregate supply relation for food holds a fixed and severely inelastic position during each period of little or no gain in production efficiency. But in periods of widespread technological advance and rapid gains in production efficiency, the severely inelastic aggregate supply relation for food shifts, or drifts, to the right taking up successively more productive positions (the movement of the aggregate relation from position AA to BB to CC by years is traced by the dashed line).

The Role of Price Uncertainty. Up to this point the analysis has assumed price certainty; implicit to the analysis has been the assumption that each producer-decision maker knew with certainty the sale price of his product during the production planning phase. But in practice we know that this assumption is not satisfied. The farmer-producer never knows with certainty what price he will receive for his product at the end of the production period when it moves to market. He plants and takes a chance.

Now orthodox theory presumes that most individuals like to take a chance, assume a risk in the expectation of a greater gain, where that risk involves a minor portion of the individual's income, but that most individuals seek to avoid risk where that risk involves a major portion of their income. Thus we presume here that farmers do not like the price risk that attaches to any one of their major enterprises. They would like to avoid this risk bearing, or would be willing to insure against it if they could. The risk growing out of price uncertainty that attaches to any major enterprise thus involves a cost—a cost to be added into the cost structure of the firm.

Since the cost of bearing risk will vary with the quantity produced, it follows that we are dealing with a variable cost that enters into the calculation of marginal costs. The cost of bearing risk by farmers has the effect of increasing marginal costs, and hence contracting the supply relation for the commodity in question. And the greater the price uncertainty which attaches to a commodity, the greater will be the risk premium, and the contracting influence on the supply relation. So we get the picture—price uncertainty has the effect of reducing supply over what it would be with price certainty.

How one treats price uncertainty in estimating work, I for one do not know. But the logic is clear, and at least we know what to expect when government, or farmers themselves, take action to increase price certainty in agriculture.

Perhaps of even greater importance is the effect of price uncertainty on the adoption of improved practices and new technologies on farms. When price uncertainty is great and the adoption of a new practice, or tech-

nology, involves an important cash outlay or long term commitment, farmers have a way of putting off such adoptions. But when prices are expected with relative certainty, as say under price support, and those prices translate into acceptable unit returns, farmers are ready and willing to adopt the new practices, or technologies, and enter into the financial commitments that are involved. At least this would seem to be the overriding conclusion of the tobacco study made by Glenn Johnson[13] at Kentucky and the regional potato study centered at Minnesota.[14]

V

Output Response Relations. By output response relations we have in mind a concept which describes how output, or actual quantity supplied, varies with price over some period of dated time. With an increase in price it is reasonable to expect a positive output response. But in this case the increase in quantity produced and offered for sale may result from an increased employment of resources or technological advance or, and more probably, some combination of the two. And rates of resource substitution and technological advance will in turn depend upon such conditions as degree of price certainty, liquidity position of farmers, and profit *versus* workmanship drives. In other words, this relation describes pretty much what happens in the real world.

But because technological advance is incorporated into the response relation, *the output response relation is not reversible.* It traces out one output path with rising prices and another with falling prices. Thus, the output response relation is sort of a hybrid concept, or if you prefer a derogatory term—mongrel concept, which is related to the concept of supply, and is useful for predictive purpose, but is unlike the text book cases.

Commodity Response Relations. The suggested configuration of the output response curve for some commodity such as whole milk or soybeans is presented in Figure 3. In the price increasing phase the response curve in Figure 3 is more elastic than the corresponding supply relation would be, because in this case the quantity offered for sale increases in response to rising prices as the result of two processes working in concert: (1) resources are attracted from less profitable farm enterprises and (2) the adoption of new production methods is stimulated, particularly those involving additional cash outlays. Generalizations with respect to the in-

---

[13] *Burley Tobacco Control Programs,* Kentucky Agric. Exp. Sta., Bul. No. 580, Feb. 1952.

[14] *An Economic Analysis of the Impact of Government Programs on the Potato Industry of the United States,* Minnesota Agr. Exp. Sta., Tech. Bul. No. 211, June 1954.

fluence of such conditions as degree of price certainty, liquidity position of farmers and profit *versus* workmanship drives on the position and slope of the commodity response curve are not easily made, because the nature of such influences are not fully understood and such conditions vary from time to time and among commodities. But a particular commodity response study at a particular point in time that ignores these conditions will have limited value for predictive purposes.

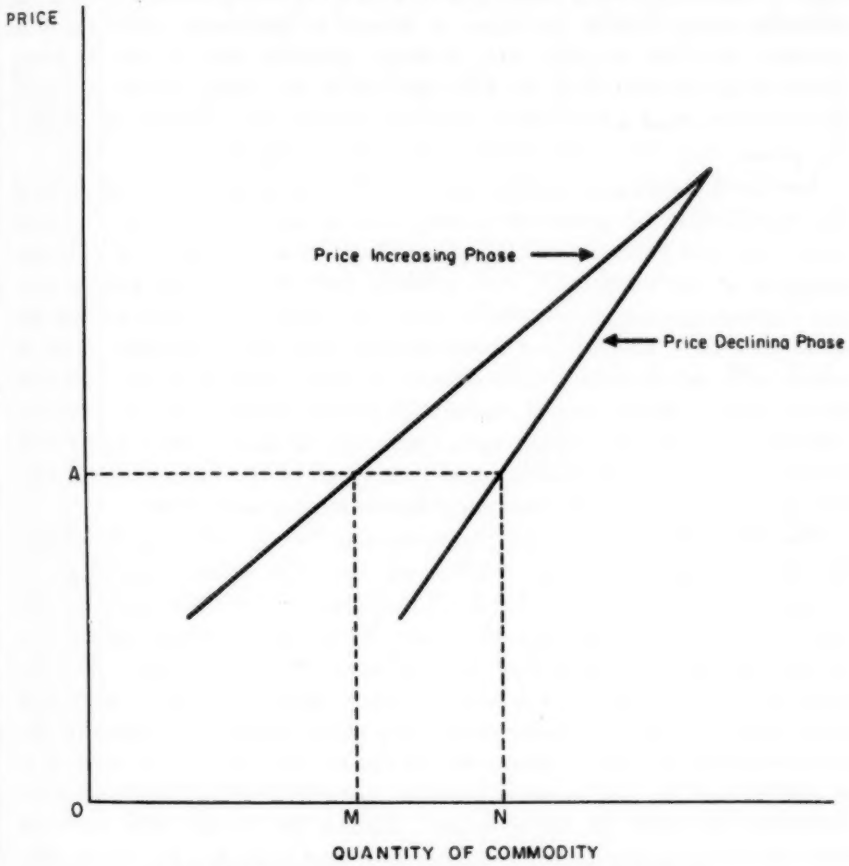


FIG. 3.—THE RESPONSE CURVE FOR SOME COMMODITY.

The output response relation is not, however, reversible. In the decreasing price phase, the quantity offered for sale declines, but at a less rapid rate than in the increasing price phase. This follows from the fact that a technological advance once adopted is rarely given up; it is not given up, because by definition a technological advance reduces unit costs. Once adopted a farmer will try to hold on to an improved practice,

because whatever the product price his unit costs are lower with the practice than without it. Thus in response to a relative price decline, some resources employed in the production of the commodity may be expected to shift into alternative enterprises, but the new methods adopted in the upswing are maintained. The result is a response curve that is less elastic in the price declining phase than in the price rising phase. This means that producers stand ready to produce and sell, at some particular price, a larger quantity in a declining market than in the *previous* rising market. In terms of Figure 3, producers stand ready to produce and sell, at price OA, a larger quantity ON in the declining phase of the market than the OM amount in the rising phase. It should be noted too, that a time dimension has entered the analysis; the declining phase must obviously follow in time the rising phase.

Another hybridizing element must be introduced at this point. Even if the substitution of resources among enterprises occurred at the same rates, and the gains in efficiency resulting from technological advance occurred at the same rates, it is unlikely that the response relations for two commodities such as whole milk and soybeans would exhibit the same elasticity. This follows from the fact that one important factor in whole milk production is also a farm product, namely feed. And feed prices tend to move up and down with animal product prices. Thus the cost structure for the whole milk enterprise tends to move along with whole milk prices and nullify some part or all of the influence of a relative price change on resource substitution among enterprises.

The effect of this price-cost phenomena is that of reducing the elasticity of the output response relation—in both the price increasing and decreasing phases. And under the conditions of the little problem outlined above, it explains why the elasticity of the response relation for whole milk is lower than that for soybeans. It suggests, also, how the elasticity of the response relation for whole milk in its price increasing phase may be, and in its price decreasing phase certainly is, less than the guess-estimate of .3 or .4 presented for the whole milk supply relation in an earlier section. And some economists notwithstanding, the type of information provided by the response relation for whole milk could be more useful to policy decision makers than that provided by supply relations.

Few if any empirical output response curves exist in the form hypothesized here. This is true for at least two reasons. First, although John Cassels discussed the nonreversible character of "supply curves" in practice as far back as 1933[15] the distinction between *supply relations* and *response relations* has never to this writer's knowledge been made clear

[15] "The Nature of Statistical Supply Curves," *Journal of Farm Economics*, April 1933.

prior to this time, hence a clear cut concept of the output response relation has not emerged to be measured. Second, the use of time series data in linear single-equation regression models, as was done in the response studies of the 1920's, could not yield estimates of the nonreversible type of response curve hypothesized here. The derivation of empirical response curves, nonreversible in character, would require as a minimum

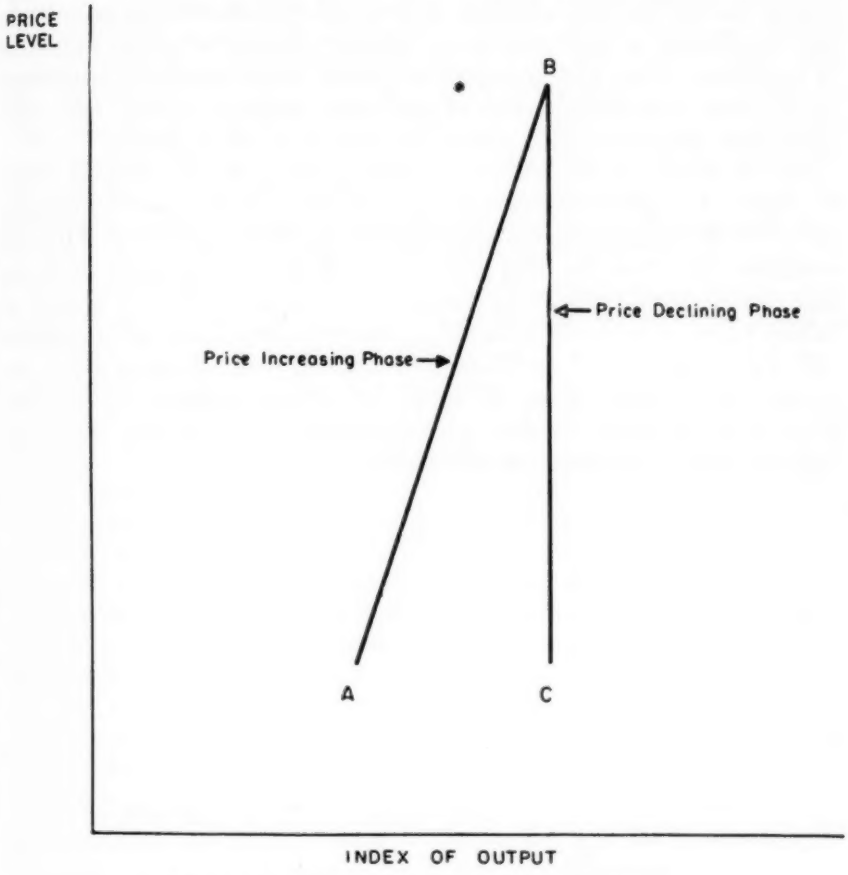


FIG. 4.—RESPONSE CURVE FOR TOTAL AGRICULTURE.

of analysis that price-quantity observations over time to be differentiated by phase of price movement. This was not done in the 1920 studies, and few response studies have been made since that time.

Aggregate Response Relations. The aggregate output response relation assumes the same general configuration as that postulated for the commodity response relation, except that the curves involved in the aggregate concept are presumed to be more inelastic in both the price increasing

and decreasing phases than for the commodity concept (compare Figures 3 and 4). The logic of the more inelastic curve in Figure 4 than in Figure 3 rests upon the consideration that the substitution of resources among farm enterprises is easier and more readily achieved than between the farm and nonfarm sectors of the economy. The process of resource substitution as a means of expanding and contracting output for agriculture as a whole in the short run is not effective for several reasons: the high cost of human resource mobility, lack of job opportunities in poor times, and immobility of land and heavy capital. Aggregate output expansion in agriculture since 1920 has resulted almost exclusively from technological advance, and these periods of aggregate output expansion have typically been associated with good times and rising farm prices.

By following the above line of reasoning, the aggregate response curve in Figure 4 is portrayed as having some slope in the price increasing phase—with rising prices the total quantity produced and offered for sale increases. But when the farm price level falls the total quantity produced and offered for sale does not contract; the response curve in periods of falling prices is perfectly inelastic or nearly so. Resources do not transfer out of agriculture on a net basis, and technological advances made previously are retained. Thus, the aggregate output response curve in the price declining phase assumes a configuration similar to that of the aggregate supply relation discussed earlier.

THE WHEAT SUPPLY FUNCTION*

B. J. BOWLEN†
Kansas State College

A SIMPLE regression model using lagged adjusted price as the independent variable and acreage planted as the dependent variable has been used successfully in studying farmers' responsiveness to price in the production of some commodities.[1] This procedure has been used for wheat production in the United States for the period 1926 to 1952, omitting 1938 to 1943 inclusive and 1950, since production in those years was rigidly controlled. A regression coefficient of $b = 1.05$ and a standard error of b some three times as large, thus indicating a most unsatisfactory level of probability, was obtained. The result obtained by using first differences of planted acreage and first differences of adjusted price ratios for the preceding season was only slightly better. It would be incorrect to conclude that price was not an important consideration in farmers' decision making process, but rather the direction and extent to which farmers respond is influenced by a most diverse set of conditions among areas, among farms within an area and over time.

Some of the diversity was thought to be removable by considering smaller, and presumably more homogeneous areas. A simple regression model using adjusted first differences of acreage planted and first differences of price was applied to Kansas data. Again the period 1926 through 1952, omitting the control years 1938 to 1943 and 1950, was used. However, the results were only slightly better. The state of Kansas was then subdivided into three areas. Nine counties in the west-central part characterized by very low rainfall were considered one area. This area has experienced more than a 100 percent expansion in wheat acreage during the past twenty-five years. Fifty-two counties in central Kansas, typical of the Great Plains wheat producing area in rainfall, length of time developed and other respects, were considered a second area. The third area consisted of forty-four counties in eastern and northern Kansas. Corn, soybeans, and forage crops are grown extensively in the latter area. The hypothesis was that the same basic factors that influence the wheat acreage in this area apply in the East North Central States.

---

* Contribution No. 224, Department of Agricultural Economics, Kansas Agricultural Experiment Station, Manhattan.

† Formerly Assistant Agricultural Economist, Kansas Agricultural Experiment Station, Manhattan. Currently with Caterpillar Tractor Co., Peoria, Illinois.

[1] Henry Schultz, *Statistical Laws of Demand and Supply With Special Application to Sugar*, University of Chicago, 1928.

Robert M. Walsh, "Response to Price in Production of Cotton and Cottonseed," *Journal of Farm Economics*, Vol. XXVI, May, 1944.

The results of a simple regression analysis on the effect of changes in the adjusted price of wheat in the preceding season on changes in seeded acreage are shown in Table 1. In general, the results are highly unsatisfactory. However, some observations may be made regarding each area. Although the analysis using first differences of seeded acreage and lagged prices seems to indicate no relationship in the western area, a simple regression of seeded acreage and time is highly significant. The regression coefficient $b = 53.26$ (thousand acres) has a standard error $s_b = 10.56$. "Student's $t = 5.04$, with 19 degrees of freedom, is significant at the one percent level of probability. This suggests that the relatively favorable prices during the war years (combined with favorable weather) encouraged the development of the area for wheat cultivation. However, the

TABLE 1. COEFFICIENTS FOR RELATIONSHIPS OF FIRST DIFFERENCES OF WHEAT ACREAGE SEEDED AND FIRST DIFFERENCES OF ADJUSTED PRICE IN THE PRECEDING CROP YEAR, 1926–52, OMITTING 1938–43 AND 1950

Area	Coefficient of Correlation (r)	Constants for regression equation $Y=a+bX$		Standard error s_b	"Student's" t value for slope	Probability factor for t value
		a thousand acres	b thousand acres			
(1) State of Kansas	.37	515.0	24.96	15.95	1.56	.20
(2) Nine western counties	.03	98.3	0.36	3.49	0.10	—
(3) 52 central counties	.32	260.0	15.42	11.50	1.31	.20
(4) 44 eastern counties	.39	157.0	9.24	5.62	1.64	.10 to .20
(5) 44 eastern counties—1937 data omitted	.62	91.3	7.76	2.88	2.68	.02

lag between the decision to commit capital and labor resources to the cultivation of land and the eventual production of wheat would be longer than one year and might vary from farm to farm.

The regression of first differences of planted acreage as a percentage of total cultivated acreage on first differences in adjusted prices had a higher probability than that found for first differences in absolute acreage. The regression, nevertheless, was not significant at an acceptable level of probability. It may be said, therefore, that favorable prices may attract resources to land development, but less favorable prices may not cause them to be withdrawn as readily, particularly in a highly specialized area where no alternative use of the resources is immediately available. A succession of negative price differences related to production for the years 1932 through 1934 was accompanied by almost no change in seeded acreage. Although the price difference affecting production for the following year, 1935, was positive, the first sharply negative acreage difference is observed (Figure 1). In this highly specialized wheat area, three

successive years of declining prices resulted in a substantial number of farm foreclosures that show up in the fourth year by the decrease in seeded acreage. The lag in response to three successive years of lower prices may be considered the gestation period for the significant withdrawal of resources from wheat production for this specialized wheat area during the years under consideration.

The number of observations is not large enough to separate years of positive and negative price difference. Even if it were, the results might not be improved since the order in which positive and negative differences occur and the number of successive movements in one direction will be important in either the decision to expand production or in determining the ability of the firm to remain in production.

The results obtained for the central area are more encouraging statistically. However, the probability factor for t was not high enough to justify

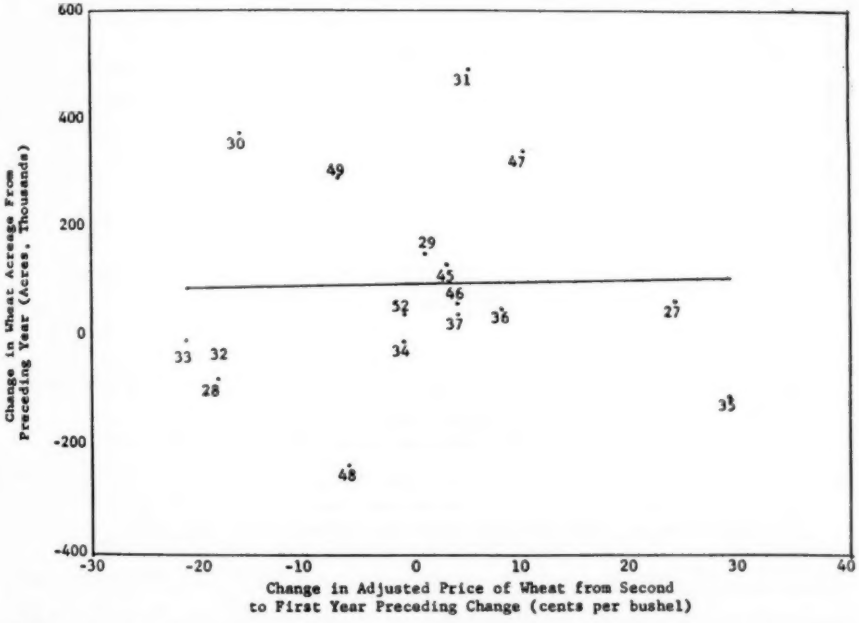


FIG. 1.—FIRST DIFFERENCE IN WHEAT ACREAGE IN NINE WEST-CENTRAL KANSAS COUNTIES RELATED TO FIRST DIFFERENCE IN ADJUSTED PRICE OF WHEAT IN PRECEDING CROP YEAR (1926 TO 1952 OMITTING 1938 TO 1943 AND 1950).

an elasticity estimate. The cumulative effects of a succession of positive price differences may be observed from the data (Figure 2). However, the effect is less clear in the case of a succession of negative differences. A regression using first differences in the relative price of wheat and the

"next best alternative" was not appreciably better than the regression using absolute price differences. The analysis was confused due to the decreasing importance of corn and the increasing importance of sorghum during the period considered.

There are advantages associated with wheat production that cannot be included in conventional econometric models. Wheat provides winter cover for fallow, while sorghum does not; therefore, the erosion-control problem is more complex in the case of the latter crop. Wheat is considered to have higher yield certainty. Planting wheat in the fall pro-

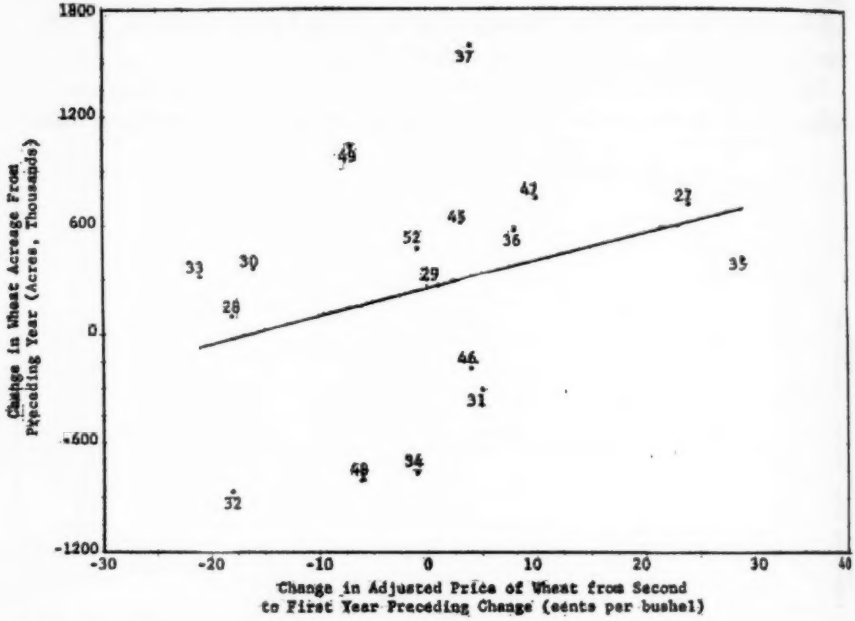


FIG. 2.—FIRST DIFFERENCE IN WHEAT ACREAGE IN FIFTY-TWO CENTRAL KANSAS COUNTIES RELATED TO FIRST DIFFERENCE IN ADJUSTED PRICE OF WHEAT IN PRECEDING CROP YEAR (1926 TO 1952 OMITTING 1938 TO 1943 AND 1950).

vides for the contingency of favorable crop conditions in the early part of the year followed by less favorable growing conditions later when the sorghum is produced. Or, if the opposite weather conditions prevail, that is, unfavorable conditions during the wheat season, the wheat land may be recultivated and a sorghum crop planted. Thus, wheat and sorghum are not mutually exclusive alternatives in a given crop year until the wheat season is well advanced when the outcome of the wheat crop can be estimated with reasonable precision. Thus, the probability of having no crop is reduced by planting wheat even though it may prove desirable to abandon it and replant sorghum at a later date.

Thus, both the erosion problem and the high-risk nature of the area decrease the supply elasticity of wheat in this typically Great Plains area. Empirical research conducted in Kansas in April 1955 indicated the significance to farmers of some of the nonprice considerations (Table 2).

The results of the regression analysis for the eastern area were more

TABLE 2. FARMERS WERE ASKED THE QUESTION: WHAT ADJUSTMENT WOULD YOU MAKE IN YOUR WHEAT ACREAGE IF ALLOTMENTS WERE ABANDONED AND THE PRICE SUPPORT LEVEL WERE DECREASED TO 65 PER CENT OF PARITY (APPROXIMATELY $1.50 PER BUSHEL) AND THE PRICE OF FEED GRAINS AND OTHER CROP ALTERNATIVES WERE EXPECTED TO REMAIN THE SAME?

	Number of farmers	Reasons for action taken[1]								
		1	2	3	4	5	6	7	8	9
(a) Increase	110		6	12	33	6	3	54	34	20
(b) Decrease	19	16	5							
(c) No change	65	25	32	4	2	1	8	2	7	
(d) Undecided	2									

[1] The reasons given are:

(a) *increase*
- (1) To cover debt payments
- (2) Because of nature of farm lease
- (3) To make better use of specialized machinery
- (4) To provide winter cover to open land
- (5) To distribute farm work more evenly
- (6) To provide wheat for feed and for straw
- (7) Could still make more money than from other crops
- (8) Because of greater yield certainty
- (9) Balance rotation better

(b) *decrease*
- (1) Better income possibilities with other cash grain crops
- (2) Better income possibilities with livestock

(c) *no change**
- (1) Income from wheat would still be comparable with next best alternative crop
- (2) Present rotation is most satisfactory for this farm
- (3) Machinery is adapted to present rotation crops
- (4) To provide winter cover crop for additional acres
- (5) To distribute farm work more evenly
- (6) To provide feed wheat and wheat pasture
- (7) Crop diversification, including wheat, is best hedge against price uncertainty
- (8) Because of greater yield certainty

* Thirty-two farms in this category were not complying with their allotment in 1955.

satisfactory (Table 1, Figure 3). The exclusion of 1937 data results in a further improvement. It was considered logical to remove 1937 data since weather conditions in 1936 resulted in more than two million acres of corn being abandoned in this area; much of the corn acreage abandoned was seeded to wheat that fall. The elasticity computed for the regression obtained (probability factor for t being .02) was .315, a value which does not disagree with what might be expected for an area characterized by several closely competing crop opportunities. The arithmetic mean acre-

age and price for the area and time period considered were used in computing the elasticity. Probably the elasticity is something greater than .315 at prices higher than the mean and something less at lower prices.

When the three areas are aggregated into state data, the results obtained appear to have no statistical significance (Figure 4). The factors that influence response to price are much different in the areas where there are close revenue alternatives from the areas where these do not exist. Although the regression results do not permit any statement about

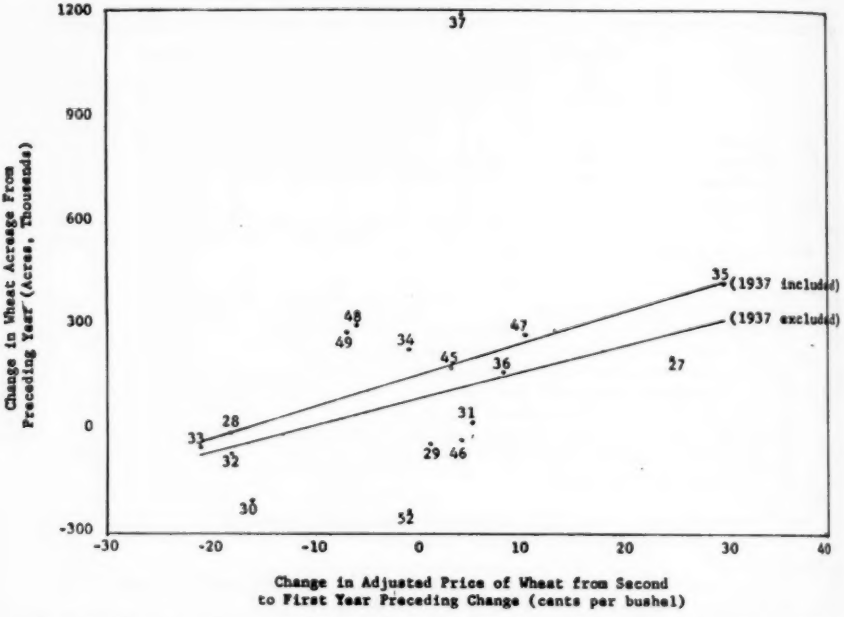


FIG. 3.—FIRST DIFFERENCE IN WHEAT ACREAGE IN FORTY-FOUR EASTERN KANSAS COUNTIES RELATED TO FIRST DIFFERENCE IN ADJUSTED PRICE OF WHEAT IN PRECEDING CROP YEAR (1926 TO 1952 OMITTING 1938 TO 1943 AND 1950).

short-run elasticity for the more specialized wheat areas, a high degree of inelasticity is suggested by other analysis.

The linear programming technique has been applied to the problem of determining the optimum combination (in a revenue-maximizing sense) of crops for a specialized wheat area. The practical range of price ratios between wheat and other crop possibilities has been used as a choice criterion. Since the results are not complete, a final statement cannot be made. However, the general nature of the outcome can be observed and some consideration of the use of the technique made.

Single valued expectations of price and yield have been used. Since the loan program has been in effect, farmers have had a good basis on which

to formulate price expectations. However, it is probable that many farmers' expectations involve a range of prices rather than a single price.[2] For this reason, a probability distribution of prices would be preferred in the model, although the mathematical solution is formidable. Yields are highly variable in the specialized wheat area. However, the correlation of the yields of different crop opportunities is fairly high. If yields were perfectly correlated, the solution would not be different from that obtained using single valued yield expectations. The yield variability, how-

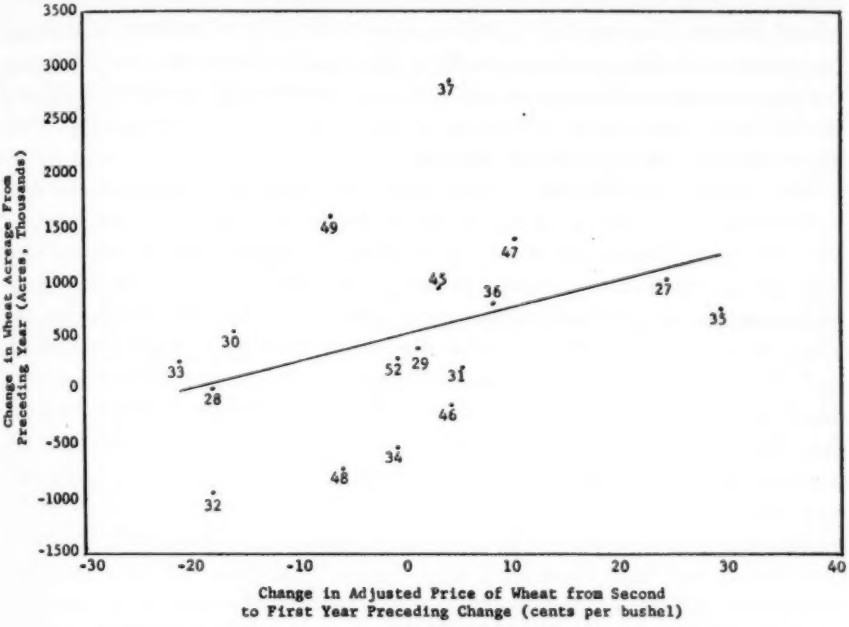


FIG. 4.—FIRST DIFFERENCE IN WHEAT ACREAGE IN KANSAS RELATED TO FIRST DIFFERENCE IN ADJUSTED PRICE OF WHEAT IN PRECEDING CROP YEAR (1926 TO 1952 OMITTING 1938 TO 1943 AND 1950).

ever, even though perfectly correlated, would affect the level of income and consequently the stability of the firm. Although the linear-program solution will be the revenue-maximizing combination of crops, it may not be the combination that farmers will choose due to the possibility of incorrect formulation of price and yield expectations or due to capital limitations or other reasons. Due to particular circumstances, some farmers may not be able to act in the manner that appears most rational. The region tends to be sufficiently homogeneous in farm size and choice

[2] M. M. Babbar, Gernard Tintner, and Earl O. Heady, "Programming with Consideration of Variations in Input Coefficients," *Journal of Farm Economics*, Vol. XXXVII, No. 2.

of crop opportunities, however, that these problems are not an important concern.

The results obtained indicate a discontinuous function with all acreage being seeded to wheat, land being the most limiting factor. Thus, at present price ratios, or even if the ratio becomes considerably less favorable to wheat, and assuming no allotment restriction, the supply function appears perfectly inelastic *in the short run.* With minor exceptions, the the acreage of sorghum that occurs is due (1) to compulsory diversion from wheat or (2) to the use of sorghum as a catch crop following a wheat failure. The acreage resulting due to the diversion from wheat can be anticipated. The acreage resulting due to abandonment of wheat cannot be anticipated, however, since it is a function of weather. Sorghum seeded as a catch crop following wheat failure is not competitive with wheat in the initial planning process.

The observation that the wheat supply function appears perfectly inelastic in the short run must be qualified, however. Since only price ratios, and not price levels, are involved in linear programming, no consideration can be made of elasticity that might result through resources being withdrawn from production due to unsatisfactory income levels. On the other hand, one cannot anticipate the extent to which resources will be added, encouraged by a favorable marginal-cost marginal-revenue relationship. It has been observed that a significant price-quantity relationship has not been found by the regression method for the extreme western area of Kansas. However, wheat acreage in the area increased more than 100 percent in approximately a twenty-five year period. At the present time, irrigation wells are being drilled in substantial numbers. One county that had three irrigation wells in 1950 has 150 now. Another county has 500 wells. Apparently, an abundance of water is available at not more than 400 to 500 feet throughout a large part of the area. Although the response to irrigation is greater in sorghum than wheat, farmers in the area consider a ten bushel increase in wheat yield an adequate return on a ten to twenty thousand dollar investment per quarter section. I suggest, therefore, that we will be in error if we conclude there is no elasticity in the wheat supply function in the specialized areas. In the short run it is probably very inelastic, but for longer periods, a favorable marginal-cost marginal-revenue relationship will attract additional resources and an unfavorable relationship, after adjustment in the supply price of resources, will result in resource withdrawal.

Conclusion

In conclusion, the following points may be made: (1) Simple regression analysis is an inappropriate tool in most instances for determining the

wheat acreage response to price, primarily due to difficulty in estimating the lag in the employment of additional resources when prices increase or the withdrawal of resources when prices decline. An elasticity of .315 was determined for an eastern Kansas area. This may serve as an estimate of the acreage response to price change in the more humid and least specialized wheat areas in the United States. On the basis of 1952 acreage (the most recent noncontrol year) a reduction of 300,000 acres of wheat from a total of 6,900,000 acres in the East North Central states would result due to the decrease in price for 1955 to 1956 support level. (2) A discontinuous and perfectly inelastic supply function is suggested for the very specialized wheat areas *during the short run*. The inelasticity will be modified by the restrictions on acreage imposed by the farm program and as a result of wheat failure due to unfavorable weather. (3) Due to the favorable relative price enjoyed by wheat, the supply function appears to be perfectly inelastic downward in the specialized areas. Adjustment in the supply price of land and lower return on invested capital and labor would be the short run consequences of lower wheat prices. (4) When marginal revenue is high relative to marginal cost, efforts will be made to intensify production as currently evidenced by extended use of irrigation and fertilizer.

THE SUPPLY ELASTICITY FOR MILK IN THE SHORT RUN

HARLOW W. HALVORSON
University of Wisconsin

ALTHOUGH the recent reduction in the price support level for milk has focused attention on the nature of its supply elasticity, this subject has been the subject of intermittent study by economists for many years. I think it is fair to say that many of these studies have met with a rather poor degree of success, part of which is due to some characteristics of the basic data economists have had to work with, and partly to the inherent complexity of the dairy industry itself. Furthermore there seems little prospect that these difficulties will become much less troublesome in the near future.

I

For purpose of gaining some preliminary notion of the likely limits of the measures we are looking for it might be well to examine some aspects of the dairy industry relevant to our problem. The dairy industry has been characterized by more stability in prices, production and incomes than any other major segment of agriculture over the last nearly fifty years. For example, from 1924-41, the average year-to-year change in production was just about 2%. Although this does not necessarily imply lack of response in production, the amount of variation we shall expect to find in measurable variables will be somewhat smaller than for many segments of agriculture. The major import of this point for our purposes is the fact that, as Fox puts it, "as much as 25 percent of the reported year-to-year variation in production of milk may have come from errors of measurement."[1] Thus we may expect to find, for statistical reasons alone, that most hypotheses to be tested will find only moderate support in the data, regardless of the force of their logical content.

There are a number of reasons based on the essential characteristics of milk production to lead one to a belief in a low supply elasticity for milk. These have to do primarily with the relatively heavy and fixed investment requirements, particularly in the northern United States and the lack of very good alternatives in much of the area where most of the milk is produced along with the fact of major dependence upon the family labor supply for confining requirements of the business. Although it is true that the trend toward urbanization may have improved alternative opportunities for the labor supply of the dairy industry, the course of technology in agriculture including dairying has also been forward to such an extent that for the major dairy areas it has been increasingly necessary for dairy-

[1] Karl A. Fox, *The Analysis of Demand for Farm Products*, U.S.D.A. Technical Bulletin 1081, 1953, page 53.

men to get bigger and more efficient or get into something else to survive. This trend may have for some the implication that farmers' responsiveness to price is increasing in the dairy industry, although there are good arguments on both sides of this question and inadequate evidence to give much support to either one.

A substantial part of the milk produced for fluid consumption in the United States is to some extent sheltered from exogenous forces by virtue of health requirements, pricing arrangements and other institutional or economic arrangements. This places a premium upon stability of production. Even more than this the variable or small producer tends to be penalized in the market place; and the incentives that are many times built into the pricing arrangements for milk usually work out in a manner leading to more effective stabilizing of production by the larger producers.

Even beyond the general economics of the individual dairy business is the cow herself. Calf production, the basis for most herd replacement, is necessary to turn on the faucet. Once started, the lactation follows a fairly regular pattern of temporary increase and gradual decrease. Although alterations in the rate of feeding give rise to some modification of the lactation curve these are relatively small. The practice of having cows freshen in the spring when they could be turned out to new pasture has been gradually modified by an increase in the proportion of fall freshenings. This has tended to warp the lactation curve of these cows by giving rise to a secondary peak and to increase their total milk production, primarily because of their greater feed intake.

Changing the pattern of freshening of a herd is not without its costs, however, since it means deferring production from individual cows along with milk income for some period plus some maintenance costs while they are dry. One of the alleged virtues of the dairy business is the monthly milk check. Any substantial change in freshening patterns can wreak havoc with it for a short period. This is a matter of no small concern to dairy farmers as evidenced by the fact that one of the major gripes with artificial insemination has to do with the erratic abilities of the veterinarian to settle a cow as compared with having a bull around.

The lactation curve of individual cows gives rise to substantial seasonal variation in milk production which can and is mitigated partly by dispersing freshenings throughout the year, and also by altering the rate of feeding. It is worthy of note that despite its wide seasonality of production, year-to-year changes in milk production are as small as they are.

The decisions made many years ago based on the then existent technologies and farm sizes often place severe limits on the expansion possibilities of individual dairymen. For example, one of the most important factors limiting herd sizes today is the lack of barn room available to

handle more cows. On most farms, making such accommodations is a major remodeling job. The application of improved technology in other aspects of dairy farm production, however, is placing a premium on making such adjustments. Uncertainty about the economic future of the dairy industry as well as recent income declines is severely rationing the use of capital in this area. On the other hand, alternatives have to be modified substantially before much change in the use of these once-committed resources will be made. For the specialized dairyman, attempts to counter a decline in income through improving technology is often a much less uncertain path to success than taking on a line of production with which he is less familiar. This is especially true in view of the capital costs of change and the probable inefficient use of both old and new capital. Although it may be argued that farmers should adjust or die, major adjustments in the dairy industry are likely to be relatively more costly than in most segments of agriculture and will not be made quickly and easily, or in response to temporary relative price change.

The seasonal variations in prices along with the modification in net prices arising out of variations in test may well give rise to a delayed awareness of fundamental changes in relative prices and a consequent delay in decision making. Interviews with a considerable number of dairy farmers leave little doubt in my mind that, although they are acutely conscious of current milk prices, this interest is focused heavily on the income side and what the market has judged their labor to be worth, and less as a guide to be used in altering production practices.

In most areas dairy farmers will not know for as much as a month after delivery of their milk what they will get for it. In Swiss cheese areas it may be as much as three to four months. Even more than this, many farmers seem to have some well developed notions of physical efficiency of production that are paramount and that will be conditioned only slowly by economic changes.

Adjustment in herd size to changing relative profitability of enterprises will come primarily therefore among the producers and in the areas having close alternatives. It is an anomaly in these days of a statistician's paradize that it is difficult if not impossible to document these changes. Although longer run supply elasticities for milk are not under discussion here, it must be stated that study of time series data has thus far offered offered little basis for judging their magnitude. Recourse has had to lie primarily in estimates based on budget studies.

II

My understanding is that one of the reasons for my being here was to report on some research in progress on the supply elasticity for milk. In

discussing this matter, therefore, I must reluctantly confess that this work is still in progress and what new evidence is presented in the product of an uncompleted job. This work has focused on the two components of total milk production, namely changes in production per cow and changes in cow numbers. This discussion focuses almost exclusively on the short time supply elasticity which works primarily through changes in production per cow.

Cassels many years ago, in connection with a milk supply elasticity problem, emphasized the point that it was silly to talk about *the* supply elasticity of any product. There is a whole family of supply curves from which elasticities can be computed, each one drawn with respect to a different time period in which, *caeteris paribus*, adjustment to price is made. The longer the time period that is considered, the more elastic will be the response, since more costs would be variable.

Efforts at analyzing supply responses in milk production whether they be short run or longer run have generally fallen into two categories: (a) those based on more or less aggregation of data in time series, and (b) synthesized responses based on typical farms budgeted to maximize returns under varying price combinations. The budget studies have focused mainly on long time responses with technological change implicit.

Many of the researches on supply response were done twenty or more years ago when the amount and quality of necessary data were much less available than today. Consequently, the results of some of these early studies were soon found wanting when subjected to reanalysis using additional data. The main ideas incorporated as hypotheses in most of these studies were not at fault. Rather the hypotheses tested were inadequate in terms of some of the basic forces affecting the milk production picture. In making this statement I am not under any illusions that even today we have nearly the complete picture before us, for there is much yet to be learned about the supply elasticity of milk production, particularly for the longer run.

For purposes of discussion let us be concerned with milk production in a given short time period (generally one-half year or one year) and the variables logically bearing on or affecting this magnitude. Of course not all production is marketed as milk or dairy products because a considerable amount is fed to calves or consumed on farms where produced. By focusing on production we will have only a first approximation to marketings, but one that is reasonably good. Most farmers try to market as much as possible of the milk they produce.

A statistically complete statement would be "milk production in the given period depends on number of cows milked times average produc-

tion per cow," but this is useful mainly for purposes of putting the problem in perspective. However, it is the contention of this paper that although these two statistical variables are not unrelated they are dependent upon different sets of factors in different time dimensions. This, plus the very fact of their interrelationship, however, casts doubt on the results of any analysis of the elasticity of total milk production that ignores its components. In perhaps somewhat more familiar jargon, the supply side of any model consists of at least two production relations, one focused on production per cow and the other on cow numbers along with one or more feed demand relations.

It is difficult to summarize the results of earlier studies in comparable fashion since in many cases the authors did not present a very complete picture of their results. There seems to have been a preoccupation with filtering the data, to detect the period of lag in production data that would maximize the relation to changes in some of the supposed explanatory variables. Results have usually taken the form of listing the correlation coefficients (usually simple) for the various lags. I think these studies may be briefly described as concluding for changes in production per cow, or for short run response (a) that there is a lag of some two to four months in the response, and (b) that the proportion of variance accounted for is generally rather small, or at least much less than one might desire.

III

For purposes of more clearly understanding the manner in which short run response to price change can manifest itself it may be desirable to describe the available alternatives briefly. By short run, I am thinking of a period of time that is less than that necessary to substantially alter the rate of turnover of dairy cows in dairy herds. The most immediate response to price change, of course, would be to alter the proportion of milk produced that is marketed. The proportion of milk production not marketed is a function of such deep seated circumstances that temporary price change will have little or no influence on this factor. The next alternative would be to change production of the present milking herd by changing the quality or quantity of feed fed. This is not as simple a matter as it may sound. If milk prices have fallen, incomes are already less. For the specialized dairy farmer to take action himself to reduce his income even further is somewhat of a strain on the reasoning. Furthermore, farmers would be somewhat shocked at the idea of starving their cows. Adjustment, such as there is, comes in the form of partially substituting cheaper and more home grown feeds for those that involve cash outlay as well as having some reduction in total intake particularly

for the lower producing cows. This will usually result in some reduction in milk production per cow, but less than the reduction in the grain and concentrate share of the ration. Variation in the amount of grain and concentrates fed, therefore, should show some correspondence with the changing profitability of converting grain to milk, usually measured by the milk-feed price index.

Changing the freshening pattern is also possible in the short run, but as indicated it involves some current loss of income. There seems little reason to believe farmers will take steps in this direction unless there is reason to suppose there has been a rather permanent shift in the seasonal price pattern. On the other hand, there is reason to believe that at least a part of the shift in freshening time is the result of innovation that would have come about without the additional price incentives available in some markets. In general, I feel we can class this type of response, to the extent to which it has occurred, as response to longer run shifts in seasonal price patterns or innovation rather than in the class of short run response.

In focusing on the short run elasticity of milk production, then, we are essentially forced to focus on the factors that give rise to short run changes in production per cow. On the down side, liquidation of herds can occur of course, resulting in decreased milk production. But the slow evolution of the dairy cow cycle plus the logically large relative price decline that would be necessary to call forth this type of response indicates this could be only of occasional influence. However, since culling is going on continually in herds and as old cows or low producers approach the end of a lactation they may be marketed sooner or later depending on present and prospective price relationships. Parsons has shown a limited relation to exist in New York between spring cattle marketings and the spring milk feed price ratio.[2]

The data of potentially most value in analyzing changing production per cow appear to be the series of reports, as of the first of the month, on production per cow in the herds kept by crop correspondents. Feeding rates per cow as of the same date are available for herds kept by dairy reporters. Since these data do not cover the same universe, using them together in an analysis is open to some question, and the coefficients that are derived are likely to be slightly biased. This limitation should be kept in mind in interpreting the results. Since the barn-feeding and the pasture-feeding periods are likely to call forth responses in different degree, production and feed input data per cow were averaged for

[2] Merton S. Parsons, *Effect of Changes in Milk and Feed Prices and in Other Factors Upon Milk Production in New York*, Cornell Experiment Station Bulletin 688, March 1938, pp. 47-49.

November through April and May through October. On the assumption that input should be reflected in output, milk production per cow per day for the period was related in a series of 4-variable correlations with grain fed per cow during the period, hay production and cow numbers. Hay production as an indicator of roughage supplies is an obvious variable for the winter season. It was also taken as an indicator of roughage from pasture during the summer even though a so-called pasture condition index is currently reported. Both were tried with similar results.

The inclusion of a cow number variable may perhaps need some explanation. Cow numbers may be expanded by holding old cows longer or stepping up the rate of addition to herds, or both. There also may be some shifting of dual purpose cows from beef to dairy categories to inflate the apparent changes. In any case the immediate effect is reduced average production per cow since the production per lactation tends to increase up to the third or fourth and decrease thereafter. A stepped-up rate of culling, that is reduced cow numbers, will generally tend to increase production per cow. Since all the analyses were made using first differences of logarithms from the preceding year, emphasis is on measuring the effect of relative changes.

On a national basis the inverse association of changing cow numbers and production per cow are obvious for years of substantial change in cow numbers by merely looking at a not too recent outlook chart book. During the years of little change in cow numbers production per cow tends to rise, which is likely the result of technological progress in dairying.

Results are presented in Table 1, and include all the regions for both seasons even though many of the coefficients are not significant either logically or in terms of their attached standard errors.

Several conclusions may be drawn from this table. (1) The average milk production per cow in the United States is increasing at approximately one per cent per year. (Note that this does not refer to the efficiency of the cow as a converter of feed to milk.) In our analysis the average value of this component in terms of production per cow is given by the constant term. Here the logarithms times 10^4 are given, and their antilogs would indicate the average percentage change from the preceding year. (2) An increase in cow numbers tends to reduce production per cow as hypothesized, the inverse effect being about one-half except for New England where it is considerably less. The explanation for this may lie in the fact that herd additions are affected to an important degree by importing cows from outside the area. (3) Hay supplies as an indicator of summer roughage seems to fit the hypothesis that good pastures mean more milk in the summer since, except for the West, the coefficients are properly signed. The elasticities are all very low, however, being mostly

TABLE 1. MILK PRODUCTION PER COW PER DAY: FACTORS AFFECTING YEAR-TO-YEAR CHANGES IN SEASON AVERAGE PRODUCTION, UNITED STATES AND REGIONS, 1931–1954

Area	$R^2_{1.m}$	Constant term $a_{1.m}$[1]	Effect on production per cow of a one percent change in:					
			Grain and concentrates fed per cow		Hay production[2]		Cow numbers	
			$b_{12.34}$[3]	Standard error	$b_{13.24}$[3]	Standard error	$b_{14.23}$[3]	Standard error
			Summer Season					
United States	.57	23.9	.099	.051	.174	.037	−.400	.151
North Atlantic	.54	17.5	.208	.074	.135	.036	−.065	.256
East North Central	.40	43.3	.027	.043	.114	.043	−.431	.228
West North Central	.66	55.7	.040	.030	.088	.029	−.593	.153
South Atlantic	.38	61.1	.043	.068	.050	.037	−.495	.180
South Central	.70	23.6	−.002	.080	.227	.040	−.408	.133
West	.41	44.6	.119	.052	−.088	.049	−.361	.145
			Winter Season					
United States	.63	42.3	.270	.093	−.101	.052	−.465	.169
North Atlantic	.74	33.5	.623	.143	−.156	.033	−.298	.276
East North Central	.30	63.8	.107	.091	−.085	.061	−.665	.334
West North Central	.71	78.1	.149	.069	.055	.045	−.616	.164
South Atlantic	.35	101.8	−.119	.123	−.010	.056	−.767	.279
South Central	.54	18.5	.192	.136	.078	.052	−.596	.186
West	.18	54.8	.060	.102	−.034	.088	−.486	.265

[1] Logarithms times 10^4
[2] Assumed to be an index of pasture in summer season.
[3] Regression coefficients based on first differences of logarithms.

less than 0.2. Peculiarly, the effect of roughage supplies in winter generally is inconsistent with the presumption that milk production should vary directly with roughage supplies. These pasture results are consistent with other studies for particular states, notably those of an impressive analysis by Brandow.[3] He attempted to make allowance for hay quality by considering rainfall during the hay growing season, with somewhat better results. However, it is evidently true that we need better data on the feeding value of roughage to approximate the real world. (4) The response in milk production to changing inputs of grain and concentrates is low in terms of experimental evidence[4] with above average cows. The summer responses to changes in grain feeding are considerably less than those of the winter.

Two partly alternative conclusions may follow. (1) The basic data inadequately reflect the amount of substitution that is taking place, and/or (2) despite farmers' intentions as they may be reflected in changing feeding rates, the reflection of farmers' intentions in production per cow is to a significant extent lost in the process of conversion of feed to milk, perhaps in part by adjustments in the body weight of cows and other losses.

---

[3] G. E. Brandow, *Changes in Milk Production in the United States*, 1924-51, Pennsylvania Agric. Expt. Sta. Progress Report #97, February 1953, pp. 11-13.

[4] Einar Jensen, *et al.*, *Input-Output Relationships in Milk Production*, U.S.D.A. Technical Bulletin #815, May 1942, p. 60ff.

Feeding Rates as Measures of Intentions

In order to get some notion of the extent of responsiveness of *farmers* rather than *cows* to prices, farmers' intentions as indicated by changes in rates of feeding were related to changes in the milk-feed ratio for the three month period ending in the first month of the winter or summer season, whichever applied. Since roughage supplies would affect rates of concentrate feeding, these also were included in the test. Results are presented in Table 2.

TABLE 2. GRAIN AND CONCENTRATES FED PER POUND OF MILK PRODUCED: FACTORS AFFECTING YEAR-TO-YEAR CHANGES IN SEASON AVERAGES, UNITED STATES AND REGIONS, 1931–1954

Area	$R^2_{1.23}$	Constant term $a_{1.23}$ [3]	Effect on rate of feeding per pound of milk of one percent change in:			
			Milk-feed price ratio[1]		Hay production	
			Net effect[2]	Standard error	Net effect[2]	Standard error
			Summer Season			
United States	.73	88.980	.506	.094	−.247	.094
North Atlantic	.58	89.246	.278	.085	−.159	.071
East North Central	.78	110.142	.623	.103	−.485	.113
West North Central	.78	125.376	.677	.112	−.349	.106
South Atlantic	.22	72.289	−.324	.141	−.242	.139
South Central	.46	112.096	.241	.097	−.203	.099
West	.06	48.695	.121	.137	.189	.197
			Winter Season			
United States	.82	− .940	.256	.065	.280	.061
North Atlantic	.45	−10.403	.040	.057	.130	.040
East North Central	.69	− 3.356	.385	.088	.235	.097
West North Central	.90	− 3.128	.331	.043	.339	.039
South Atlantic	.10	3.685	−.238	.166	.136	.162
South Central	.06	56.039	.041	.089	−.108	.101
West	.04	38.667	.158	.177	−.010	.210

[1] Milk feed ratio for March–May for summer and September–November for winter.
[2] Coefficients from analysis based on first differences of logarithms.
[3] Logarithms times 10^4.

By rates of feeding here is meant the pounds of grain fed per pound of milk produced. Although there may seem to be some circularity involved in this, it is a commonplace that dairy farmers feed according to production, so that the cows that can efficiently produce more milk get more feed. In other words, feeding is adjusted to the productive ability of the cows in the herd. For example, production per cow per day in the winter months in the United States has increased by slightly more than 1 percent per year from 1931 to 1954, *but there has been practically no change in the trend of pounds of grain fed per pound of*

milk produced in these months. Feed input has fairly well kept pace in a linear way with milk output per cow. Consequently, it seems to be impossible to appraise from these data whether or not the dairy cow has become a more efficient converter of feed to milk. All we know is that her capacity to produce milk might have increased. There also has been a steady trend toward heavier rates of summer grain feeding, the increases being at the rate of 2 to 3 percent per year.

The general results of this analysis are that insofar as farmers intentions are reflected in changes in the ratio of grain to milk, their response seems to be inelastic being in no case higher than 0.7. Adjustments in winter feeding rates are more elastic than for the summer in most regions. In summer, increased roughage supplies affect in logical fashion the proportion of grain to milk fed. In winter, why larger hay supplies should result in heavier grain feeding and result in reduced production per cow is difficult to account for except in terms of inadequacies in the data. Most of the results seem reasonably significant for the major dairy areas, but elsewhere few conclusions are warranted. The South Atlantic region has been a particularly perverse region in terms of these results.

These two analyses have attempted to trace the effects of price relationships on feeding rates and the effect of ration changes on changes in production per cow. Since there is value in knowing the direct relation between changes in milk production per cow and changes in the milk feed ratio, this relation was computed. The results of this analysis are presented in Table 3.

TABLE 3. MILK PRODUCTION PER COW PER DAY: FACTORS AFFECTING YEAR-TO-YEAR CHANGES IN SEASON AVERAGE PRODUCTION, UNITED STATES AND REGIONS, 1931–1954

Area	$R^2_{1.234}$	$s_{1.234}$[1]	Effect of a one percent change in:					
			Milk-feed price ratio		Hay production[2]		Cow numbers	
			$b_{12.34}$[3]	Standard error	$b_{13.24}$[3]	Standard error	$b_{14.23}$[3]	Standard error
			per cent					
Summer								
United States	.56	38.3	.029	.036	.122	.036	−.469	.140
North Atlantic	.25	43.1	.086	.057	.114	.048	−.169	.327
East North Central	.42	47.5	.032	.033	.108	.036	−.439	.223
West North Central	.60	22.2	.053	.028	.095	.028	−.496	.161
South Atlantic	.34	66.1	−.006	.049	.047	.048	−.493	.187
South Central	.73	24.7	.059	.040	.251	.040	−.479	.125
West	.26	57.0	.029	.040	−.005	.057	−.403	.158
Winter								
United States	.64	59.6	.135	.045	−.052	.040	−.508	.161
North Atlantic	.73	69.7	.212	.051	−.234	.036	−.661	.269
East North Central	.37	72.0	.097	.051	−.089	.053	−.559	.325
West North Central	.60	48.3	.109	.043	−.021	.036	−.438	.181
South Atlantic	.64	106.6	.220	.054	−.128	.051	−.537	.215
South Central	.70	50.8	.198	.055	−.053	.056	−.343	.172
West	.41	68.4	.182	.066	−.086	.077	−.334	.231

[1] Logarithms times 10^4.
[2] Assumed to be an index of pasture in summer season.
[3] Regression coefficients based on first differences of logarithms.

These coefficients indicate the short run supply elasticities for milk based on production per cow are roughly in the neighborhood of 0 to + 0.25, with estimates for the summer season in the lower part of the range and those for the winter in the upper part. The summer-winter differences in supply elasticity or elasticity of feeding may be due mainly to differences in average level of production or feeding in the two seasons.

For purposes of attempting to appraise the possibility that farmers' short run response to price increases were different than those for price decreases, data for the East and West North Central regions were combined into years of higher and lower milk-feed price ratios and their relation, along with hay supplies to rates of feeding, were determined. Results are presented in Table 4. These are mainly suggestive of the

TABLE 4. GRAIN FED PER POUND OF MILK PRODUCED, EAST AND WEST NORTH CENTRAL REGIONS COMBINED, 1931–54

Years of	$R^2_{1.23}$	$a_{1.23}$[1]	Effect of a one percent change in:			
			Milk-feed price ratio		Hay production[2]	
			$b_{12.3}$[3]	Standard error	$b_{13.2}$[3]	Standard error
			per cent			
Price increases Winter	.87	−63.9	.611	.088	.042	.075
Price decreases Winter	.89	33.5	.468	.063	.157	.056
Price increases Summer	.73	241.1	.411	.947	−.875	.338
Price decreases Summer	.04	−65.7	.023	.340	−.170	.176

[1] Logarithms times 10^4.
[2] Assumed to be an index of pasture in summer season.
[3] Regression coefficients based on first differences of logarithms.

possibility that short run response to price increases are more elastic than are the responses to price decreases.

The level of aggregation used here may well cover up substantial differences within regions. Brandow, for example, working with data for New York, Pennsylvania, Wisconsin and Minnesota obtained fairly substantial differences between adjacent states in responses to grain fed, pasture conditions and the milk-feed ratio. In addition his coefficients seemed slightly higher than those presented here although not significantly so. However, it seems reasonable to expect higher order aggregate

relations to be somewhat less elastic than those at a lower level, simply on grounds of internal compensations.

Conclusions

We may conclude, therefore, that on the basis of evidence up to now, the short run elasticity of milk production is less than .25 in winter and probably less than .1 in summer. Farmers' responses to price in terms of feeding rate adjustments seem more elastic in the summer than in the winter seasons. There is slight evidence that farmers may be more responsive in grain feeding to milk price increases than price decreases.

The gradual increase in output per cow based on improvements in dairying may offset a considerable part of the effects due to declines in milk-feed price relationships. Furthermore, changing cow numbers, which presumably reflect longer run estimates of the relative profitably of dairying, have a substantial impact on short run supply responses.

DISCUSSION: CONCEPTUALIZING THE SUPPLY RELATION IN AGRICULTURE

LOUIS H. BEAN
Economic Analyst, Washington, D.C.

Professor Cochrane as well as the program committee is to be congratulated in reviving our interest in agricultural supply curves. That interest is long overdue. I am not sure however that Professor Cochrane's opening observations as to the reasons for "so little good work in this area" are adequate. From my vantage point in the U.S.D.A. I am inclined to think that one of the reasons for so little work since 1930 is that agricultural adjustment programs of the 1930's drew much talent away from research. Later, World War II did the same. When I returned to the Department of Agriculture in 1947 after a four year absence I found a vast hiatus between the supply research we had done in the early days of the B.A.E. and the little that was being done after the war.

I accept Professor Cochrane's prophecy that agricultural economists will some day come up with useful and reliable supply curves. The inaccuracies and the inadequacies contained in high official statements of the present administration are sufficient to drive scholars and researchers to throw more light on the subject.

I am extremely puzzled by Professor Cochrane's effort to draw a distinction between the "supply relation" and the "response relation." The supply relation as he defines it I can understand. It is a particular net relationship of price to supply when other factors are held constant. But "the response relation describes what will happen to the quantity—when we do not hold all other things constant." For the moment I cannot conceive the method nor the result Professor Cochrane has in mind. I hope he will demonstrate in a subsequent paper.

In his discussion of the commodity supply relation Professor Cochrane introduces a schedule of short run supply elasticities ranging from .1 to .2 in the case of wheat to 1.0 to 2.0 for vegetable crops. This is admittedly imaginary

and as far as I am concerned quite dangerous and unrealistic. In the first place there is danger that this tabulation, once in print, will be taken by the unwary as if the figures emerged from systematic research. Once released it will be difficult to catch up with them or recall them. In the second place the supply function, it is my impression, can seldom be defined by a linear relationship at the point of the means. At the risk of being accused of immodesty I would like to suggest that anyone interested in "the shape of the supply curve" for a number of commodities look up my early, probably long forgotten, effort in this field in an article "The Farmer's Response to Price" in the June, 1929, issue of this *Journal*. Only youthfulness can now explain this effort to find the shape of the farmer's response to price in data for the limited period of the 1920's. But I have recently reworked the supply curves for cotton, potatoes and hogs, including data for the 1930's and 1940's as well, and was pleasantly surprised to find that the same shapes emerge; not identical since basic data have been revised, but close enough to warrant my urging you to be suspicious of linear relationships, especially when linear relationships are resorted to for the insufficient reason that they are easier to work with. I doubt that farmers in responding to price in their crop and livestock operations make it a point to respond according to a linear relationship to save the agricultural price analyst the trouble of tracking down a more complicated curve.

Professor Cochrane's insistance on differentiating between the commodity, the firm or farm and farmers as a national group is constructive and I am inclined to accept his discussion of the factors and considerations that pertain to each type of analysis. I do, however, want to flag "the aggregate supply relation for the nation," here presented as a vertical line. The simple reason for finding a vertical line is merely that *total* acreage from year to year remains practically unchanged. When an unchanging figure is plotted against a varying level of prices, whether that changing price level is for one year or for some combination of prices and price groups for more than one year (as is the case in this paper), obviously there can be nothing but a vertical "relationship." But that would also be the case if instead of prices you used a series of wage rates or rainfall or any other time series. The point is that there is no mathematical way of explaining the variations in supply series that does not vary. This holds for the firm as well as for the nation if the farmer makes full use of all his supply resources every year, varying only the proportions as between crops. Coming from the respected laboratory of Professor Cochrane's directed students, some may take the vertical supply (or vertical demand) curve as more meaningful than it really is. I would like to see Professor Cochrane withhold the vertical supply curve from his publications now since I am inclined to think he will do so five years hence if not now.

Professor Cochrane argues that the role of technological advance is to shift the national vertical supply function to the right and that it does so by jumps. For the nation as a whole I am inclined to think that productivity per unit of input does not jump, hold steady for a period, and then jump again. That the aggregate of progress from year to year is regular and not erratic is suggested by the fact that the erratic points in Professor Cochrane's index of changes in agricultural production efficiency are associated with weather changes, and the effect of these should be removed from the efficiency index for a clearer indication of the technological factor alone. For agriculture as a whole, technology, like *natura, non facit saltum.*

A final comment, on Professor Cochrane's commodity and aggregate response relations during periods of rising prices and declining prices. Prices usually have some relation to profits. It may be that after a period of expansion the relation of prices to profits has changed. Consequently the difference in response that Cochrane visualizes as between periods of rising and declining prices might disappear if profits per unit were substituted for price per unit.

I take it that this paper is a forerunner of others to come. All of us interested in the nature of the supply function in agriculture hope that Professor Cochrane's researches now "in the mill" will be available to us in another of his papers next year.

DISCUSSION: THE WHEAT SUPPLY FUNCTION AND SUPPLY ELASTICITY FOR MILK

G. L. JORDAN
University of Illinois

Mr. Bowlen found no statistically significant relationship between lagged adjusted prices of wheat and acreage planted using a simple regression model, nor were his results much better using first differences of these two variables. He states that "the direction and extent to which farmers respond is influenced by a most diverse set of conditions among areas, among farms within an area and over time." He then attempted to get rid of some of the diversity by using more homogeneous areas.

Even when the state of Kansas was divided into three areas on the basis of climatic and other conditions, including possible substitution of other crops, the results were far from satisfactory.

For the western Kansas area there was no significant relationship between first differences of prices and acreage planted. But there was a significant relationship between seeded acreage and time which suggests that the favorable prices *and weather* during the war induced an increase in acres. Contraction of acreage appeared to result only after several years of unfavorable prices (depression), and then as the result of forced withdrawal of capital applied to farming in an area in which there were no alternatives to wheat growing. The results suggest that in areas where substitution of enterprises is not feasible the adjustments to price changes take longer than one year and that the downward adjustments are delayed as long as availability of the operator's capital permits.

In the central area of Kansas, corn and sorghum grains were increasing in importance over the period but the erosion problem and high-risk nature of the area favored wheat production and kept its supply elasticity low. Nonprice considerations were important to the operators. No statistically significant measure of elasticity was obtained.

In eastern Kansas where farming is more diversified and where alternative enterprises are more likely to be profitable, the results of the regression analysis were more satisfactory and an elasticity of supply of .315 was obtained.

A linear programming technique suggested that at price ratios even considerably less favorable to wheat than present prices the supply function was perfectly inelastic in the short run in the specialized wheat area. However, wheat acreage has increased in this area and Mr. Bowlen suggests that "for

longer periods, a favorable marginal-cost marginal-revenue relationship will attract additional resources while an unfavorable relationship, after adjustment in the supply price of resources, will result in resource withdrawal."

Mr. Bowlen's findings suggest that the problem of determining the short-run price elasticity of supply is not simple—a satisfactory econometric model would have to include several independent variables and some of them might have to be aggregated over a period of years, possibly with different weights for recent than for earlier years, and some might have to be represented by rate of change. It would not seem necessary to use only first differences of the independent variables because the dependent variable, acreage planted, was expressed as first differences. For some variables it might be very difficult to obtain empirical data. Also it is entirely possible that there is not just one supply function, but that it changes over time and that there may be a short-time and a longer-time price-quantity relationship on the supply side. Possibly wheat farmers respond more to income than to price, which means that weather conditions affecting yields are as influential as price. In the absence of a more complicated model that would give proper weight to all the factors farmers take into consideration in determining wheat acreage planted, measures of supply elasticity may have to be limited to areas and time periods in which factors other than price are very similar. The problems of aggregation for purposes of estimating response on a nation-wide basis would remain formidable.

Mr. Bowlen recognized the complexity of the problem he faced. The fact that he didn't obtain highly significant measures of farmers' response to price certainly doesn't mean that his efforts were in vain. But the problem and challenge for its solution remain. Mr. Bowlen's report should prevent others from oversimplifying the problem.

In the paper on supply elasticity for milk, since the elasticity of supply of a product is closely related to the availability of alternative uses of resources devoted to production of the product, Mr. Halvorson examined these alternatives. He indicated that a low supply elasticity for milk might be expected in northern United States because (1) a relatively heavy and fixed investment is required for which there are no profitable alternative uses, (2) good alternatives to dairying are lacking, and (3) major dependence is placed on the family labor supply for the confining requirements of the business.

Because the variable or small producer tends to be penalized in the market place, any quantity response to price is likely to be limited largely to producers already established in the business. The established producer can feed more heavily even if it is customary to base the ration on the production of the individual cow. It takes time to increase the size of the cow population or to improve the productivity per cow. New capital outlays may be a requisite to expansion and a sustained price rise may be necessary to induce such capital outlays.

Mr. Halvorson, following Cassels, pointed out that there is a whole family of supply curves for any product and that the longer the time period considered the more elastic the response, since more costs would be variable.

The research reported by Mr. Halvorson dealt with changes in production per cow and changes in cow numbers. He emphasized short-run supply elasticity which was based largely on short-run changes in production per cow. The time period used was too short for milk cow numbers to change appreciably. Cow

numbers could be reduced quickly, but in practice they seldom are reduced promptly in response to changes in the price of milk.

Farmers' response to price (milk-feed ratio) was measured by the changes in their rates of feeding as represented by the pounds of grain fed per pound of milk produced. Hay production was incorporated as the second independent variable in a correlation analysis. The correlation was not high, but it was still lower when milk production per cow per day was used as the dependent variable and milk-feed ratio, hay production and cow numbers were used as dependent variables. Mr. Halvorson's estimate, based on evidence available to date, is a short-run supply elasticity in the neighborhood of .0 to +.25 with estimates for the summer season in the lower part of the range and for winter in the upper part of the range. Farmers also fed more grain when milk prices increased than they did when prices decreased, although the evidence is not conclusive on this point.

Although the regression coefficients and correlations are not particularly convincing the evidence presented does emphasize the short-run lack of response in production to milk-feed price ratios. The standard errors of the coefficients suggest that the problem is too complicated to be handled with correlation analysis with only two or three independent variables. It was not reported what response farmers made to changes in the price of milk in contrast to the milk-feed ratio. First differences of logarithms of the variables were used. It is entirely possible that more satisfactory results could have been obtained by using changes in the independent variables for more years prior to the change in quantity. An econometric model that would give correctly weighted emphasis to all the factors a dairyman must consider would be complicated indeed. But all the evidence suggests that farmers do not sell cows nor quit feeding them as the result of a short-run drop in prices. As Mr. Halvorson pointed out many factors besides price combine to cause short-run stability in milk production.

INDUSTRY COOPERATION IN MARKETING RESEARCH

(Joint Session with American Marketing Association)

Chairman: Harry C. Trelogan, Agricultural Marketing Service, USDA

ASSISTANCE AVAILABLE FROM INDUSTRY

R. D. HARDESTY
The Kroger Company

AS A PRELUDE, we might as well face up to the problem that as an industry we may not always feel that the problems you want to study are of mutual interest. Most frequently this is because we are interested in short term results. Big business has few theoreticians—unless they are on a deferred income plan. We need immediate and positive results from any marketing research in which we engage.

I. For cooperative research, the food retailer offers:
   1. Willingness to cooperate—on problems of mutual interest.
   2. Physical facilities.
   3. Aid in planning the study.
   4. Aid in supervision.
   5. Financial savings.
   6. Better use of the results.
   7. Plenty of problems.

II. From cooperative research, the food retailer expects:
   1. Objective approach. As John Dewey says, "Thinking begins not with premises, but with difficulties; and it concludes not with a certainty, but with an hypothesis that can be made 'true only by the pragmatic sanction of experiments.'" We feel that good research begins with a problem—not with inadequate premises, assumptions, or propositions. That it should set up alternative solutions and proceed to get data that will enable us to choose the best result.
   2. We expect that a pertinent problem will be chosen. If we can reach agreement on the importance of a problem, the relatively few jobs we are able to complete will be much more useful.
   3. Good definition of the problem.
   4. Projectable results:
      Results that are meaningful to our management.
      Results that can answer a problem of ours.
      Study run a sufficient length of time.
      Study run in a sufficient number of stores for reliability.
   5. All data collected made available to us; we don't want facts hidden from us.
   6. Results that can help us increase sales and decrease costs—preferably in the short as well as long term.
   7. Minimum of store level interference.
   8. A time table that can and will be followed.

III. Suggestions for improving cooperative research:

1. Define a single problem—work toward its solution.
2. Define the proposed study so that the findings will be meaningful and useful.
3. Insure completion of projects and studies by assigning responsibility, if necessary.
4. Stick to a time table; all work must be completed and reported; negative results sometimes are as helpful as positive findings.
5. Timely reports of findings; don't wait until their usefulness is gone.
6. Run the study a sufficient length of time so that results are valid.
7. Work toward improved techniques.
8. Use the proper size "supermarkets" so that results can be used by the industry.
9. Have enough trained men to do the job—don't overload or be pressed for time. Good research, like aged whiskey, takes time.
10. Minimum of interference with store operations.

For those of you who are not well acquainted with Kroger's research, I would like to point out that our management has a very understanding and efficient policy for cooperative studies. We welcome the opportunity to work with other interested groups. However, the burden of justifying the use of our facilities falls on the other party. He must subscribe completely to our rules and stay within the bounds when executing the program—but the rules we set up are those that will provide a fair test under normal conditions.

INDUSTRY COOPERATION IN FROZEN FOOD DISTRIBUTION RESEARCH

H. WAYNE BITTING
Agricultural Marketing Service, USDA

IN THE brief time allotted to me, I would like to set forth a few principles that are essential to effective cooperation between the marketing research worker and industry. These principles are almost elementary, but I fear that they have not been given adequate consideration by those of us in marketing research. We have attempted to apply these principles in research on frozen food distribution, and we believe that the results obtained warrant further thought.

These principles are: (1) Have something useful to offer industry in return for its cooperation; (2) take advantage of industry counsel during the planning phase of the study; (3) formulate survey questions so that they are clearly associated with the purposes of the study; and (4) include only questions germane to the objectives and formulated in such a manner that the minimum confidential information is requested.

There are two additional principles related to maintaining future cooperation with industry. They are: (1) Provide timely reports on results of the study; and (2) direct the findings of the study into proper channels for action within the trade.

Industry cooperation is essential to good marketing research. Since industry is the laboratory for market research activity, it behooves the market research project leader to develop industry cooperation. How often do market research projects miscarry through failure to obtain adequate cooperation? How often are elaborate sets of assumptions and statistical techniques applied to cover our inability to develop the industry cooperation necessary to obtain adequate data? Statistical techniques make valuable contributions to analysis, but they cannot "purify" inadequate data or correct erroneous assumptions. Key factors involved in the managerial decision making process may be concealed or blandly "assumed away" under a broad set of assumptions.

A competent market research project leader must possess an adequate kit of research and statistical tools. However, his competence as a problem solver is judged by his ability to collect pertinent data as well as by his analytical prowess. Industry cooperation is the key to obtaining data with maximum usefulness. It is suggested that this phase of market research warrants greater emphasis as an operational tool.

Research projects in the distribution of frozen foods provide a case study, showing how we evaluated the problem of obtaining industry support and developed such cooperation. It will be evident that the methods used were fitted to the situation and may not be equally appli-

cable to other research projects. However, the principles followed in developing industry cooperation should remain the same.

Problem Setting

One phase of our over-all assignment was to appraise the potential market for frozen fruits, and the impact that development of the market might have upon the corresponding fresh and canned products, returns to growers, market organization, and location of producing areas.

In order to evaluate the future, we needed first to know what is happening today. When we began, available data were limited to the frozen food pack statistics and the monthly reports on cold storage holdings. From the pack statistics, it was evident that only one-third of the frozen fruits, excluding citrus juice concentrates, were packed in containers of 10 pounds or less—sizes marketed through retail and institutional channels. The bulk of the pack was in larger containers used primarily by preservers, ice cream makers, and pie bakers. Only fragmentary information was available as to the fruit usage patterns in these industries. Practically no information was available as to the proportion of the pack used in the frozen form, anticipated changes in this use pattern, reasons for anticipated changes, and likes and dislikes of the users for the frozen products available.

The initial studies had to fill in the gaps in our marketing information as a basis for evaluating the future. To obtain such information for frozen fruits meant surveys to learn the quantities of the fruits and berries used by preserve manufacturers, pie bakers, and ice cream manufacturers. These surveys had to be designed to cover each industry in its entirety on a coordinated basis. The question arose as to how such data could be collected within the limited budget available. It was obvious that mailed questionnaires would be required. It was also evident that this information would be of limited use to individual manufacturers, but that it should be useful to trade organizations and over-all industry groups in formulating or defending industry policy. Therefore, efforts to gain industry support were concentrated on the trade association level.

Obtaining Industry Cooperation

Before we approached the trade associations, we reviewed the question: What do we have to offer these groups in return for their cooperation? Our bargaining position included:

1. Willingness to collect information useful to industry;
2. Availability of experienced market research personnel;
3. The probability that a government research agency could obtain greater response than could be obtained by industry groups;

4. The fact that the survey provided a vehicle for collection of collateral information desired by industry at little or no extra cost;
5. Our ability to measure the intensity and relative importance of the problems that the industry helped us to pinpoint.

In return, the trade associations were in a position to do the following:

1. Evaluate questionnaires as to content and ability of manufacturers to answer questions from accounting records customarily maintained in the industry;
2. Brief the researcher as to pitfalls to be avoided, such as issues of secondary importance that are controversial questions within the industry;
3. Arrange meetings with key industry personnel, particularly in some larger corporations where cooperation might not be assured if wrong channels were contacted;
4. Prepare news releases and trade bulletins informing membership of their knowledge of or participation in the project.

Obtaining industry cooperation began with the planning and development of the studies. The first step included contacting the trade association of each respective industry. The problems of the industry were discussed and guidance was obtained in selecting problem areas falling within the scope of our study. Following this, the questionnaires were enlarged to include information desired by the trade and the USDA research laboratories that would not warrant separate circularization. These questions also assisted in developing interest of the individual firms in the survey.

After the aims and goals had been established and the content of the questionnaire tailored to meet these problems, work was initiated in developing a form that would yield maximum response. The questionnaire was screened by a psychologist and public relations expert to get proper impact in length, wording, and question arrangement. Furthermore, the questionnaire was formulated so that the purpose of the study was clearly associated with the questions asked. In addition, the questions were stated in such a manner that the minimum of confidential information was requested.

Prior to release, the questionnaire was pretested upon three manufacturers by mail and without advance notice. This was done to stimulate response to the mail questionnaires. After receipt of the pretest schedules, personal interviews were arranged with officials of these firms to determine possible improvements in the questions.

When the final copies of the questionnaire were mailed, a forwarding letter summarizing the purpose of the study went with them. Each section

of the questionnaire contained an introductory statement showing the use to be made of the answers to specific questions.

Thirty days after the first mailing, a follow-up letter and questionnaire were forwarded to each nonrespondent. Another 30 days were allowed before a sample of nonrespondents was prepared for personal interview. All nonrespondents not included in the sample for personal interview were sent a third and final letter, which was sent either air mail or as a registered letter, together with a return addressed air mail envelope and questionnaire. The response from each series of letters was gratifying. The sample of nonrespondents for personal interview, although small in number as compared with the original sample, yielded results that were invaluable. Since these interviews followed the return of most of the questionnaires, questions and problems appearing in these responses were covered in the personal interviews. This provided an additional advantage in interpreting the survey data, particularly in light of the fact that the pattern of response was the same in both personal interviews and returned mail questionnaires.

The survey of the preserving, ice cream making, and pie baking industries were complex and required considerable checking of accounting records. When the surveys were completed, we had obtained returns from more than 90 percent of the pie bakers—wholesale, multiunit retail, and major house-to-house distributors. More than 80 percent of the preserve manufacturers and almost 70 percent of the wholesale ice cream manufacturers also responded. In the latter case, more than 1,000 questionnaires were received. We believe that our project planning for industry cooperation paid off for both the industry and the research agency.

Presentation of Results

Timeliness in reporting marketing research results is a basic element in increasing future support from the industry.

In each of our surveys we made an effort to prepare preliminary reports within 2 months of the completion of the data collection. In one case this preliminary report was made within 2 weeks of the receipt of the last mail questionnaire. This enabled us to present the information in time for the industry's annual convention—a time when most industry members could be present. In addition, a copy of the preliminary report was mailed to each cooperating firm. The preliminary reports were followed by final reports giving a more complete analysis and interpretation of the data, together with supplemental information obtained from other studies.

The distilling of results for presentation is always a problem. We attempt to prepare our reports as practical summaries of the studies. The facts are given visibility through the use of charts and tables.

A final step in the presentation of results includes directing the findings in proper channels for action within the industry. This is the "follow through" to the research results. We are currently engaged in this activity as a part of our research program, and the future looks promising.

Summary

Cooperation, like marriage, is a two way proposition—each party must contribute if it is to be a success. So it is in marketing research.

It has been demonstrated in the work on frozen food distribution that the marketing research agencies have several strong cards in their hand in working with industry. Its most effective area of work is generally in problems of broad scope or of general industry interest. Individual firms usually are unable to handle this type of problem. Research agencies also can generally get much better response than industry groups to this type of question. The public research agency that has gained trade respect (1) on maintenance of confidential nature of figures and (2) on providing a sound analysis of the problem has a decided advantage in obtaining industry cooperation.

The market researcher should not lose sight of his obligation to the trade to have a project that warrants study and to limit questions to those germane to such an analysis. To improve results he should take into consideration timing, public relations aspects, and "old fashioned common sense." This applies to all types of marketing studies whether they be of primary interest to producers, processors, distributors, retailers, or consumers.

INDUSTRY COOPERATION IN STUDIES OF FRUIT AND VEGETABLE PACKING HOUSE EFFICIENCY*

B. C. FRENCH
Michigan State University

PERHAPS the most obvious factor involved in studies of fruit and vegetable packing house efficiency is that such studies require the cooperation of industry. Industry—or more correctly, the individual firms included in an industry—provide the principal source of information and data needed to carry out the research. These firms are also the principal users of the research; and cooperation to be fully effective must carry through to the final application of results. The discussion that follows is concerned with the effect of the type of study on the degree of cooperation, methods of obtaining cooperation, means of getting the results applied, and a brief evaluation of accomplishments.

Cooperation and Objectives of the Study

The amount or degree of cooperation that may be forthcoming in any study is affected in large part by the specific objectives of the efficiency research and the kinds of conflicts that may be involved. Studies so far have been concerned almost entirely with aspects of efficiency involving comparative costs of alternative methods of performing various operations, development of improved methods, economies of scale, and the like. Cooperation in this type of study has been good. The objectives are clear and easily recognized by industry. Although some minor conflicts of interest may be involved, the studies appear to be of advantage to most of the industry and of absolute disadvantage to a very few.

Considerably less emphasis has been placed on studies of the efficiency of the organization and competitive structure of an entire industry. Analysis of this type may require probing into the more intimate details of business policies and management. Conflicts of interest may be involved. Although social benefits may be demonstrated, they may not be impressive to the few individual firms that may be disadvantaged because of the research. Thus, we may expect a more reluctant form of cooperation in this kind of study and perhaps quite a number of definite refusals. In general, however, even in this area an adequate degree of cooperation may be expected with careful approaches to the problem.

Obtaining Cooperation

Three principal methods or approaches have been used to obtain industry cooperation. These may be classed (1) as direct contacts with indi-

* Journal Article 1805, Michigan Agricultural Experiment Station

vidual firms, (2) as work through industry associations or agencies, and (3) as direct participation of industry agencies in research. The different approaches overlap, of course, and in some cases two or even all approaches may be used simultaneously.

Direct contacts with individual firms

This approach is probably best illustrated by California studies of deciduous fruit packing house efficiency, particularly in the initial stages, and in a similar type of study initiated recently in Michigan. Packing firms were approached individually. The objectives and expected benefits from the study were explained and cooperation was sought on a unilateral basis without contact through any industry association or agency. Certain industry agencies were contacted for the purpose of obtaining lists of firms, but they took no direct action to stimulate cooperation.

There was an important reason for this approach. The study involved a considerable amount of experimentation with relatively new research methodology. Although the procedures used eventually proved very successful, the results at that stage were still uncertain and a "quiet" rather than a "big splash" policy seemed desirable.

A careful selling job is essential for obtaining effective cooperation. This was brought out clearly in the California study by the failure, at the beginning, to obtain the endorsement of a large cooperative marketing association that represented a substantial portion of the deciduous fruit packing plants in the state. The research was almost stopped before it began. However, careful salesmanship with firms not associated with this marketing organization proved to be fruitful and this eventually even won over the firm that had been holding out. Personal contacts through well-established employees of state and quasi-governmental organizations were very helpful in gaining the confidence of the firms.

In both California and Michigan a large number of firms agreed to cooperate even when it was clear that they had considerable doubts as to the specific value of the study for their particular operations. Some managers appeared to be cooperating largely because of a desire to support the work of the University and a willingnes to contribute to the so-called fundamental aspects of research.

Cooperation has been highest in the engineering phases of the efficiency research—almost 100 percent. Most firms are very willing to allow the researchers to carry out work measurement studies in their plants and to observe the details of the plant processes as they actually operate. As might be expected, somewhat more reluctance has been encountered in obtaining data from the plant records. Few firms have refused directly, however. Some have resorted to various subterfuges to limit the amount

of information disclosed but most have given free access to nearly all records that were available and would be of use in such studies.

Work through industry agencies

Where industry associations or committees exist or can be set up, they provide an excellent means of obtaining contact with individual firms, stimulating interest in the study, and putting the results into effect. The citrus packing house studies being carried out at the University of Florida are an outstanding example of this type of cooperation. This project was conceived and initiated by researchers. To get the project launched agricultural extension workers arranged for discussions with industry leaders. This was followed by a meeting with members of the Florida Citrus Packing House Association at which the University personnel explained the nature of the proposed study, what they hoped to accomplish, and the amount of time and cooperation required. A guiding committee composed of both industry and research people was organized. Industry members of the guiding committee aided in selecting and contacting plants to be included in the study. The specific research plans, however, were formulated entirely by researchers. This committee has continued to meet periodically to discuss the progress of the research, problems of the industry, and application of the research findings to the solutions of these problems.

Research workers at the University of California at Los Angeles and Davis have a similar arrangement with California citrus packers. Studies are carried out through an industry research committee with industry representatives from each of the several producing districts. Other examples of work through industry agencies include studies of lettuce harvesting and packing in California (primarily in presenting results) and potato packing in Florida. Where industries are not well organized, this type of arrangement is obviously more difficult to achieve. Generally, highly organized industries tend to be found in areas where there are a number of rather large producers or cooperatives.

Of course, even though the work in these studies is carried out through industry agencies, ultimately it must be brought down to an individual plant basis. The advantage of the industry agency is that it provides an excellent means of establishing relationships with these plants and maintaining an interested group ready to receive and apply the results of the research. The disadvantage of working through industry agencies is that it may tend to develop restrictive pressures on the research. The industry committee may want to dictate the direction and nature of the research. Demands for quick results may lead to premature publication or incomplete analysis. These difficulties can be overcome but they should be kept

clearly in mind when any type of cooperative arrangement is contemplated.

Direct participation of industry agencies in research

In recent years there have been an increasing number of cases where industry agencies themselves engage in or contract for specific types of research. The work of the Washington State Apple Commission is a notable example. Much of the Commission's work is now done by a private research organization—the Fruit Industries Research Foundation. Other examples may be found in a recent study of packing and shipping lettuce in cartons and crates by the Western Growers Association under contract with the U. S. Department of Agriculture. The California Grape and Tree Fruit League has a similar contract for a study of plum packages. Funds for these projects come from both governmental and industry sources.

An important factor to be considered in administering these contracts is the coordination of the work with the activities of the local experiment stations. Lack of coordination in some instances has led to duplication of work and to generally unsatisfactory relationships and results. Without such coordination the whole area of cooperation among industry, the U. S. Department of Agriculture, and the state experiment stations might be seriously weakened.

Contracts of this type with experiment stations themselves so far have been slow to develop. The field is still wide open. It may be a promising area in the future as industry groups be come more aware of and more interested in the possibilities of efficiency research as an aid in reducing costs and improving operations.

Disseminating Results

Research results rarely are published in complete detail. To be of greatest use to individual plants they may require elaboration and modification to fit specific conditions. This calls for a vigorous marketing extension program that differs from the traditional marketing extension in two important respects. First, it may require work with individual plants as well as with the entire group. In this respect it would be somewhat like the newer farm and home planning extension. Second, effective work with marketing firms may require that extension personnel actively engage in some phases of the research so as to be familiar with the intimate details of the plant operations and with the nature of the research results. As in the research itself, a meshing of several disciplines may be required, with primary emphasis on economics and engineering.

An important step in this direction was taken recently at the Univer-

sity of California with the employment of an extension specialist with a plant efficiency research background to work with packing firms in extending the results of their project on efficiency in fruit marketing. Similar steps have been taken in Michigan, although no personnel have been hired yet and the extension work will not be limited to fruit and vegetable packing firms. Progress also has been made in Pennsylvania where a recent study of apple packaging methods was carried out with extension personnel participating actively both in suggesting the problem and in the collection of the field observations.

Where contacts with industry associations have been strong, such as in Florida, researchers themselves have engaged in a considerable amount of extension activity. This fits into the framework suggested above but is open to the possibility that this activity may eventually make serious inroads into the amount of research accomplishment. The studies may be more effective if some individuals carry major responsibility for extending the results, leaving the other members of the team free to concentrate on research.

Accomplishments

A full evaluation of the accomplishments of the various studies of fruit and vegetable packing house efficiency is impossible. Although in most cases the research findings have suggested adjustments which could lead to important cost reductions, we do not know to what extent the reports of findings have actually been read and used. Extension efforts in this area are still on a very limited scale. Moreover, and perhaps most important, we have no way of evaluating the effect of the development of improved research methodology and increased knowledge of the nature of plant operations on the long run returns not only to the fruit and vegetable growers and packers, but to society as a whole.

Of course, many examples of specific application of the findings of these studies can be cited. Space limitations do not permit mentioning more than a few. Some, such as the shift to volume fill of orange cartons, accomplished largely by industry cooperation with personnel at the University of California at Los Angeles, have led to fairly spectacular savings. Somewhat smaller, but nevertheless substantial savings have been achieved through the development of a bulk degreening process by Florida workers. Frequently, however, the savings come through relatively small adjustments in many phases of the plant operation or through adjustments that are restricted to a small number of plants. Some of the more easily recognizable examples include the development of a lightweight mechanical lift for high piling apple boxes in storage in the Pacific Northwest, the development of an improved grading table for

California citrus, the development of an improved device for closing celery crates in Florida, and cost reductions through consolidation of several existing citrus plants as a result of a University of California study.

In cases where the studies have dealt with the comparative efficiencies of existing methods, the application of the findings are more difficult to recognize. Recent observation in California packing houses has indicated that many of the methods suggested as most efficient in the research reports are being adopted, but no attempt has been made to determine whether or not these changes were brought about because of the studies. In several instances the research results have been used to aid firms in the planning of new facilities or reorganizing old facilities. Although perhaps it cannot be defended as necessarily an "accomplishment," an additional result of these studies has been to make many plant operators "cost conscious." Areas of high and low cost have been pointed out and comparative studies have led to vigorous action on the part of some high cost plants to improve their operations.

Although many more examples of specific achievement can be cited, these few suggest that the cooperative efforts among researchers and industry have led to considerable accomplishment. However, an important link remains to be strengthened. Effective application of findings of these studies requires the development of a new type of extension specialist who can work closely with researchers, industry agencies, and the individual firms within agricultural industries. In this way, these studies should continue to lead to significant improvements in marketing efficiency.

INDUSTRY COOPERATION IN MARKETING FACILITIES STUDIES

WILLIAM C. CROW
Transportation and Facilities Branch,
Agricultural Marketing Service, USDA

DURING the past year the Agricultural Marketing Service has assisted 43 localities in developing plans for and promoting the construction of improved marketing facilities in addition to its work in improving handling methods and equipment and transportation. Each of these studies was made on request of and in cooperation with industry groups.

There are several reasons why industry requested assistance in developing improvements in marketing facilities. Perhaps the principal reason was that in each case industry people were faced with a problem that had to be solved and, because of the results of the work we have done over the years, believed that we could help them find the proper answer to their problem. The problems to be solved varied somewhat from one locality to another but in the main the requests were due to the existence of one or more of six circumstances. In some cases wage rates had become so high that some method of reducing handling costs had to be found. Elsewhere the volume handled had outgrown existing facilities so new facilities were needed. In still other places old marketing facilities had to be abandoned because they were in the way of street, highway, or some other redevelopment project, so new facilities in a different location were a necessity. Some of the requests for assistance in planning improved marketing facilities were due to the production of new products in an area for which marketing facilities did not exist or to expansion in the production of other products to the point where the existing facilities were inadequate. Some modifications in facilities were necessitated by changes in marketing techniques such as the marketing of larger quantities of many products in frozen form, shifts in places where processing was being done, and the growth of prepackaging, all of which made the existing facilities inadequate. Because of the pressures of competition these problems had to be solved for many of the firms involved to continue to have profitable operations or to remain in business.

These requests for assistance in improving marketing facilities were made in a variety of ways. In some cases the requests came from local or national trade organizations; in others by petition of the marketing firms concerned; and in still others from chambers of commerce, other civic groups, city officials, or farm organizations. In many cases individual firms would write us about the problems they were facing, request our sugges-

tions, and offer their facilities and cooperation in making these studies to find the answers.

In the making of these studies the Agricultural Marketing Service has received extensive assistance from the industry groups involved. In developing plans and promoting the construction of new city wholesale food markets, wholesalers provide data on volume handled, handling costs, sources of supply, area of distribution, rents paid, and many other subjects; make suggestions as to the kinds of improvements they feel are needed; and make their facilities available for cost studies on a case-method basis. Retailers and other buyers at these wholesale food markets supply information on sources of supply, procurement costs, and problems. Railroads furnish information on volume unloaded at various places and on their ability to service satisfactorily specific sites that are being considered for new facilities. Trucking firms supply information on volume handled between various points and cartage rates. A great deal of information is supplied by city officials on such subjects as traffic flow, highway plans, and land values. Many large distributors have provided engineering data on facility layout and costs, as well as on handling methods and equipment. Engineering firms and other agencies provide information on soil conditions and construction costs. Real estate firms make appraisals of probable land costs. Newspapers publish data and recommendations and often give extensive support to the proposals for new facilities, pointing out the benefits that they would bring to the various groups concerned. In some cases advertising agencies have helped develop brochures showing the kind of facilities proposed and contrasting them with the facilities in which food handling is currently being done. In many localities lawyers have volunteered assistance in developing corporation charters and proposed legislation. Bankers and insurance companies have been of great help in developing satisfactory plans for financing. In some cases even the mayor, members of the city council, and policemen have gone out to collect some of the information needed. State agencies such as agricultural colleges and state departments of agriculture have been of considerable assistance in collecting data, supplying transportation for our employees, publishing reports, calling meetings, and presenting the results of the research to various interested groups. In many places chambers of commerce or other civic groups have organized the effort to get the new facilities built. Then any one of several agencies may build the facilities needed, including city, state, some railroad or group of railroads, a trade group, some other private corporation, or some combination of these. By such approaches as these and through the assistance of so many groups, new market facilities have been built in a large number of places throughout the country, in-

cluding Boston, Hartford, Raleigh, Columbia, Greenville, Miami, Jacksonville, Augusta, Ga., Jackson, Miss., San Antonio, Houston, St. Louis, Louisville, Indianapolis, Kansas City, and Denver. In many other places construction of new facilities is about to begin.

In making case studies of individual plants for the purpose of developing improved facility design and handling methods, the firm operating the facilities where the studies are being made supplies complete data on present plant operations and costs and usually furnishes part of the personnel needed to do the job. It makes its facilities available for the necessary tests, changes the facilities in accordance with the findings of the study, installs the equipment needed to try out new ideas, and supplies complete data on operating costs under the new conditions. By means of this approach improved designs and more efficient handling methods have been developed for frozen food distribution plants, refrigerated warehouses, cotton warehouses, fruit and vegetable wholesale stores, retail stores, and facilities used by many other types of food marketing agencies.

It would also be impossible to carry on our transportation research without extensive cooperation from many industry groups. Shippers cooperate in loading, packing, and shipping the commodity needed for transportation tests. Railroads and trucking companies provide much equipment and furnish transportation for our personnel. Refrigerator car lines have furnished a test house for the conduct of experiments. Engineering firms have supplied and installed many gadgets for experimental purposes and manufacturers have supplied materials of various kinds such as plastic abrasives for livestock tests, special kinds of floor racks, and containers.

The results obtained through carrying on this research in cooperation with industry groups have been the best evidence of the desirability of this approach. In more than half the cities where plans for new facilities have been developed the proposed facilities have been built or are under construction. Improved methods of handling cotton in warehouses have been widely adopted. An improved design for refrigerated warehouses is now almost universally used. Improved transportation methods and equipment have been widely accepted and there has been a great demand for the results of our research in wholesaling and retailing.

Much marketing research can be carried on satisfactorily only in the facilities and with the cooperation of marketing firms and agencies. By carrying on the work in cooperation with such agencies research workers are likely to turn out more practical results than they could by working alone. Furthermore, when the research results are developed in coopera-

tion with industry there is much less difficulty in getting them put to use. Our experience has been that there is no difficulty in getting industry groups interested in research that will find answers to marketing problems. It appears that the more effort the industry makes to get a study made the better it cooperates in the conduct of the study; the more it cooperates in doing the work the greater is its interest in the results; the greater its interest the more likely it is to adopt the results; and the more results that are adopted the more requests there are for additional research of the problem solving kind.

INDUSTRY COOPERATION IN MARKETING RESEARCH—POTENTIAL OPPORTUNITIES

HOWARD L. STIER
National Canners Association, Washington, D.C.

INDUSTRY'S contribution to marketing research, especially in cooperation with educational institutions or state and federal governments, can be very important. Cooperation of industry is probably more important in marketing research than in any other research field. Industry cooperation is especially important if advances are to be made in marketing theory because for the marketing research that contributes to such theory to be valid, a realistic setting is required. In the biological and physical sciences, research or experimental work can be conducted in the field or in the laboratory of the research agency. Establishing a laboratory for marketing research is another matter. Industry very often can provide the laboratory that is needed to sell various products under different (but realistic) conditions to a sample of people.

In the natural sciences, the experimental method has become a very important technique. I believe it is equally important in marketing research. Use of the experimental method in marketing research is usually followed by a high degree of reliance in, and applicability of, the results. However, the experimental approach to marketing problems has been relatively infrequent and only recently applied. Industry cooperation is almost a necessity in order to provide an efficient and appropriate experimental design in marketing research. Even with the most complete cooperation of industry it is difficult enough to provide the kind of setting that is most efficient for conducting marketing research.

The use of advanced mathematical and statistical techniques in the analysis of experimental research data is another important step in marketing research. Industry's cooperation in the extensive data processing operations involved in the application of such techniques can be very important. This is especially true in these days of costly and relatively few electronic computers. When industry cooperates in marketing research with educational institutions, private research organizations, or a federal government agency, it renders a very real public service in furthering the knowledge and application of the scientific method in the field of marketing. This does not mean that industry should play a part in *every* minor marketing research project. In broad industry-wide or national marketing problems, however, individual companies have a responsibility to work with others in furthering the advance of marketing science, the development of principles and theory in marketing. Indeed, without industry cooperation the advance of marketing theory is likely to be very slow. I think that more rapid advances have been made in the last

quarter of a century in the field of production because the experimental approach was applied much more frequently than in marketing research. Without the "laboratory" that industry can provide it will be very difficult to use the experimental approach in marketing research. And progress in developing marketing theory and principles is likely to be arduous and slow.

The study and solution of broad problems in marketing are needed for the advance of each individual company or industry. It is in this area that industry cooperation (by individual firms) will pay off in dividends to the industry as a whole and, of course, to the individual cooperating company with an alert management that sees practical applications and has the courage and vision to make innovations.

Some specific examples of the types of fundamental research in marketing where industry cooperation will be most valuable in the future are the following:

(1) Consumer buying motivation.
Why do people buy? The influence of psychological motivations in the market place. The conditions that affect and finally determine economic behavior and the time relationships over which these factors operate.

(2) Factors affecting pricing policy.
Relation of demand elasticity to price adjustments; the effect of nonprice competition.

(3) The application of mathematical programming and operation research techniques to the solution of marketing problems.
These techniques clearly provide the basis for better marketing decisions and more effective marketing administration. Work in this field to date has already resulted in important contributions while indicating the vast area of future potentialities.

(4) Measuring the effectiveness of advertising and promotion effort.
The types and nature of advertising and promotion that are effective under certain conditions; the true relationship of effects.

(5) Marketing channels and organization.
The forces that determine the development of certain marketing channels and organization and the disintegration of others. The time and direction relationships of such factors and their potentials.

In planning and conducting marketing research studies in each of the above fields, the academician and the professional research worker can provide important know how concerning the application of the scientific method to marketing research. But professional knowledge is of little value if industry does not provide the researchers with the set-up that is needed for efficient experimental design. This is where industry can contribute much. Each without the other is of little avail and progress in the

solution of current marketing problems as well as in the development of theory will be slow.

In addition, industry cooperation in marketing research offers another advantage—the opportunity for the research worker to develop a more complete, accurate and realistic understanding of marketing. The reasons are obvious why such understanding is important. The close working relationship between industry and the professional marketing research worker that is necessary to success in a cooperative marketing research project provides the conditions under which this important understanding can best be developed. And, in the final analysis, I believe industry stands to gain the most from its cooperation.

However, the marketing departments of colleges and universities, private marketing research companies and federal and state agencies also have an important obligation in such cooperative relationships. They have the important responsibility of providing a certain type of person to work with industry, people who know at first hand industry's marketing problems and who are competent and objective individuals. The participation of such individuals in cooperative marketing research projects will give a high degree of assurance that the relative efficiency of various techniques are evaluated accurately and properly applied in the solution of marketing problems.

I believe that unless marketing research workers have an opportunity to learn about marketing from direct, personal experience with industry they will be of limited usefulness. To become truly informed about marketing does require industry cooperation but it does not always require revealing trade or company secrets. Sometimes this seems to be one of the major deterrents to the active cooperation and participation of industry in marketing research projects. However, the market research worker must respect industry's desire for secrecy in certain areas and be able to understand management's viewpoint. Mutual respect, understanding and confidence must exist if industry is to obtain solutions to its marketing problems which, in turn, will promote advances in marketing theory and science.

It seems to me there is a need for marketing personnel in industry to determine the place of fundamental or basic marketing research in their programs. Deep, straight thinking and soul searching appear in order. Why do the research budgets of many large industrial companies contain substantial sums of money (up to 50% of the total research budget) for fundamental research in the natural sciences but little or nothing for fundamental research in marketing? Doesn't fundamental research in marketing offer the same potentialities as fundamental research in the fields where it is so heavily supported? Perhaps it is fundamental research in marketing that offers the greatest potential opportunity for industry cooperation in marketing research.

ACTIVITY ANALYSIS

Chairman: Burton L. French, Agricultural Research Service, USDA

LINEAR PROGRAMMING AS A TOOL IN FARM MANAGEMENT ANALYSIS[1]

CHESTER O. MCCORKLE, JR.[2]
University of California, Davis

THE purpose of this paper is to evaluate and place in perspective a research technique—linear programming or activity analysis. The areas of application in farm management analysis have only been skirted in the relatively short period of time that has passed since the initial applications to economic problems.[3]

The subject of this paper suggests four major objectives:

1. To compare linear programming with marginal analysis and the familiar budgetary procedures as to concept and assumption,
2. To point out the implicit assumptions of the technique that delineate its adaptability to various types of problems,
3. To examine some of the major farm-management production-economics problems to which this technique of research is directly applicable, and
4. To suggest areas where further research is needed and the types of

[1] Giannini Foundation Paper No. 149.

[2] Assistant Professor of Agricultural Economics and Assistant Agricultural Economist in the Experiment Station and on the Giannini Foundation, University of California, Davis, California.

[3] See Robert Dorfman, *Application of Linear Programming to the Theory of the Firm*, Univ. of California Press, Berkeley and Los Angeles, 1951; Richard A. King, "Some Applications of Activity Analysis in Agricultural Economics," *Journal of Farm Economics*, Vol. XXXV, No. 5, December 1953; Frederick V. Waugh, "The Minimum-Cost Dairy Feed," *Journal of Farm Economics*, Vol. XXXIII, No. 3, August 1951; Walter D. Fisher, and Leonard W. Schruben, "Linear Programming Applied to Feed-Mixing Under Different Price Conditions," *Journal of Farm Economics*, Vol. XXXV, No. 4, November 1953; Earl R. Swanson, and Kirk Fox, "The Selection of Livestock Enterprises by Activity Analysis," *Journal of Farm Economics*, Vol. XXXVI, No. 1, February 1954; Chester O. McCorkle, Jr. and James N. Boles, "Use of Linear Programming in Cotton Acreage Adjustment Research in California—1954," *Proceedings of the Western Farm Economics Association*, Twenty-seventh Annual Meeting, July 26-28, 1954, Estes Park, Colorado; Bernard Bowlen, and Earl O. Heady, *Optimum Combinations of Competitive Crops at Particuular Locations*, Agr. Exp. Sta. Research Bulletin 426, Iowa State College, Ames, Iowa, April 1955; Chester O. McCorkle, Jr., "Northern Kern County Cotton-Potato Farms, Short-Run Adjustments to Cotton Acreage Allotments," Mimeo. Report, Calif. Agr. Exp. Sta., forthcoming; Clifford Hildreth, and Stanley Reiter, "On the Choice of a Crop Rotation Plan," *Activity Analysis of Production and Allocation*, edited by T. C. Koopmans, Cowles Commission for Research in Economics, Monograph No. 13, John Wiley and Sons, Inc., New York, 1951.

data required for specific problems and to underline the need for more research to obtain adequate data. Further applications of the technique in different problem settings will be dependent in part on increasing its flexibility and developing and making available further suitable data.

My assignment does not include the presentation of the mathematical basis underlying linear programming. Excellent presentations of the mathematical logic are available.[4] Nor does it appear necessary to consider the computational procedure *per se*.[5] Reference to specific results available to the researcher employing this method will be made, however.

Linear Programming, Marginal Analysis and Budget Analysis

The concept of marginality has provided the basic framework of conventional production theory, as well as that of price and distribution theory. On the other hand, the technique of farm management research known as budget analysis has been used in some form at nearly all levels of farm management analysis. It is appropriate, therefore, to examine the relationship that linear programming bears to both marginal analysis and budgeting. The degree of similarity in concept and assumptions is of utmost importance in determining the extent to which linear programming will serve to solve problems in farm management analysis.

Linear programming and short run marginal analysis of the firm make the same basic assumption of profit maximization in a single planning or independent production period. In both cases it is assumed, at least implicitly, that inputs, yields, and prices are certain. At this point the similarity becomes less obvious. The conventional production function in short run marginal analysis is typically depicted as a smooth surface reflecting an input-output relationship with diminishing average and marginal physical product in some range of the total surface. By costing the inputs and pricing the output an equation of marginal values defines an optimum output (where maximization of net returns is the goal) and an optimum combination of productive factors to produce that output. In linear programming this production surface is approximated by a series of processes (vectors) originating at the origin, the slope of each usually

---

[4] The reader is referred to T. C. Koopmans, *op. cit.;* A. Charnes, W. W. Cooper and A. Henderson, *An Introduction to Linear Programming,* John Wiley and Sons, Inc., New York, 1953; James N. Boles, "Linear Programming and Farm Management Analysis," *Journal of Farm Economics,* Vol. XXXVII, No. 1, February 1955; Robert Dorfman, *op. cit.*

[5] Computational procedure can be seen in James N. Boles, *op. cit.;* also in Earl O. Heady, "Simplified Presentation and Logical Aspects of Linear Programming Technique," *Journal of Farm Economics,* Vol. XXXVI, No. 5, December 1954.

depicted as differing from the one adjacent to it.[6] This type of surface implicitly assumes that for each vector, the production coefficients, marginal products and rates of substitution are constant. That is to say, for any combination of inputs, output is directly proportionate to any multiples of the combination of inputs. Ten acres of any crop are assumed to produce twice as much as five, given the combination of inputs.

Isoproduct functions on the two surfaces are also different. On the typical "textbook" surface, these functions are smooth and subject to differentiation. On the "surface" approximated from linear programming analysis, each isoproduct function can be envisaged as consisting of a series of joined linear segments each with a different slope. Within the set of processes included, the only way a point between two defined processes can be met is through a combination of those processes. The definition of a new process within the set, which passes through the intermediate point, would yield greater output at the intersection with the approximated isoproduct function. It should be emphasized that the differences in the surface depicted by the two methods arise because in linear programming only a few of the potential alternative combinations of inputs are considered. This is not to suggest that linear programming is less accurate in describing the net production function. The same accuracy could be achieved with a complete set of input-output relationships if data were available for their construction. Choosing increments of input typical of those followed in practice is favored by some research workers and to those, linear programming may have particular appeal. However, linear segments in a production function produce areas of indifference in combination and for some types of problems, this may be disconcerting.

The distinction drawn between marginal analysis and linear programming based on the continuity of functional relationships is more apparent than real. Marginal analysis can be applied to any problem where a maximization or minimization goal is established whether the functional changes in the dependent variable are infinitesimal (as is the case with continuous functions) or are finite. With the former, derivatives can be calculated and a maximization or minimization solution pinpointed. With

[6] A process is defined as one unique combination of resources producing a specified product. When applied in the allocation problem discussed below, the process differs from the enterprise in that each alternative resource combination which can be used to operate the enterprise is defined as a separate process. Therefore, there can be as many processes defined for a given enterprise as there are known methods of carrying on that enterprise. In practice, processes are ordinarily defined at the unit level in terms of the quantities of restrictive resources required to produce the unit (acre, bushel, etc.). Of course, resources required, other than those which are restrictive, must be quantified also in order to determine the net cash return associated with operating the process at the unit level.

the latter, discrete changes can be measured by means other than differentiation. These finite changes can be compared with comparable changes in appropriate variables to approximate an equilibrium position. It is essentially the latter approach to which linear programming is the counterpart. Problems exist where alternative processes are limited in number, in which case a marginal solution involving differentiation is not possible. In such cases linear programming provides the best obtainable results.

Whether discussing physical production functions or total revenue surfaces, the same relationships hold. Isorevenue functions produced in linear programming analysis consist of a series of joined linear segments. It is here that linear programming and budgeting can be compared. This comparison can be facilitated by a brief review of the basic postulates of programming as applied to farm organization analysis. First, the physical resources available for production define and delimit the enterprise choice and size. Choice and extent to which each can be expanded depend on quality as well as quantity. Second, enterprises must be either omitted from the organization or must be carried on at a positive level. If included in the organization, output is assumed always proportionate to the inputs regardless of the level at which the enterprise is operated. Thus, linearity in input-output relationships and divisibility of resources are clearly assumed. Third, several enterprises may be included in the organization that maximizes net cash returns for the farm as a whole. However, resource use and net cash return per unit of output for any given enterprise must be the same when operated in combination with others as when operated alone, regardless of the level at which the enterprise is operated. Thus the assumption of independence is introduced. The knotty problems of enterprise interrelationships or jointness can be treated by broadening the scope of what constitutes an enterprise of "process' as it is referred to in linear programming.[7]

The computational procedure requires that the quantities of the critical resources (those in limited supply) used per land unit or unit of output by each enterprise or process be listed. The expansion of any enterprise or combination of enterprises cannot exceed the limitation imposed by the fixed quantity of resources.

The similarity between linear programming and budgeting is now ap-

[7] When discussing linear programming it is particularly advantageous to adopt the three types of jointness as defined by S. V. Ciriacy-Wantrup in his "Economics of Joint Costs in Agriculture," *Journal of Farm Economics*, Vol. XXIII, No. 4, November 1941, p. 807. The three types are "process jointness," "time jointness," and "risk jointness." By proper definition of what constitutes a process, linear programming effectively deals with "process jointness." The segregating of resource availability into time periods is undertaken in recognition of "time jointness." "Risk jointness" has not been satisfactorily dealt with in linear programming.

parent. Both require essentially the same information—specification of physical and/or economic restrictions on alternatives, input-output relationships, price and cost coefficients, and estimated relative profitability of alternatives on a selected unit basis. As conventionally practiced budgeting assumes divisibility, independence, and linearity. Skilled analysts may handle problems outside the confines of these assumptions.

Where do differences in these two computational techniques arise? Budgeting, while similar to linear programming when testing successively alternative allocations of resources to determine if changes increase net returns, contains less obvious guides for knowing when an optimum allocation is achieved. With linear programming each allocation increases net returns until this residual is maximized. Algebraic signs of a set of residual values in the computational procedure indicate when the optimum allocation is reached within the possible alternatives posed. If this degree of perfection is to be reached with budgeting, a researcher skilled in the process and thoroughly familiar with the physical and economic setting of the problem must do the work. An unskilled person has little basis for selecting successively better alternatives for testing.

If the problem is of sufficient scope to warrant programming, the researcher devotes his time working to improve the basic data required, setting up the problem, and in interpreting and adjusting the final results. Improvement of basic data involves selecting representative cost and price coefficients, collecting and interpreting field observations, making full use of experimental results available from physical production research, and fully utilizing the synthetic techniques that combine into a process the field observations and experimental results in the presence of experienced judgment. Any competent clerk can be taught the mechanical steps required to perform the analysis for most problems. Where alternatives are few or where restrictions are of minor importance in dictating entrepreneurial action, budgeting may be preferred because of less complex computational procedures. Some researchers familiar with programming in this application believe that the mechanical techniques and assumptions of linear programming focus more attention on the planning phase of the problem rather than the mechanics of the solution. For example, such important analytical distinctions as variable versus fixed cash costs must be clearly drawn in the planning phase. For persons relatively inexperienced in farm management analysis, this aspect of linear programming may serve a useful function.

Linear Programming and Farm Management Decisions

The applicability of this technique to four types of problems faced by farm operators and farm management research workers is considered. For problems (1) of cost minimization in producing a given output, and

(2) of resource allocation among alternative lines of production this mathematical technique is "tailor made." That is to say, the technique as developed and applied meets almost exactly the specifications and characteristics of the problems. Third, the optimum level of a factor input can be determined with linear programming but ordinarily other methods such as conventional marginal analysis are more direct. A fourth area of application—optimum resource use through time and selection of alternative programs for resource development—is less well explored. This is really an extension of the problem of resource allocation among alternatives. The application of linear programming to area analysis and its potential use in agricultural economics outside research are further interesting areas to be considered briefly.

Producing a given output

The applicability of linear programming to the problem of producing a given output or outputs (having specified characteristics) at minimum cost has been clearly demonstrated in some of the original applications of this technique in the field of agricultural economics.[8] A study of alternative broiler production techniques, while not concerned with cost minimization as such, did represent a study in the selection of alternative methods in producing broilers, though not of specified age or weight.[9] While two of the early applications of linear programming to the problem of cost minimization were concerned with cost minimization in feed mixing its applicability in this problem area is not restricted to this use. Where alternatives in inputs and practices are limited in number, the problem of finding minimum cost for a specified output is easily solved by budgeting, particularly if the isoproduct function is identified so that marginal rates of substitution (which may be constant over all or part of the function) can be determined. Factor price ratios required to make the decision present no problem if the assumption of constant unit prices, regardless of quantities obtained, can be made. Assumptions of linear segments imposed by the method in cases where linear programming is used need not be disturbing. Where present, the net result is an abrupt substitution in inputs when relative prices pass critical levels, followed by little or no change in inputs as their relative prices continue to change in the same direction.

Alternative lines of production

Where the numbers of alternative inputs or practices, or both, are large, linear programming will simplify the processing of data to arrive at a

[8] Reference is made to the pioneering application by Frederick V. Waugh, *op. cit.*, and to the subsequent extensions of Waugh's analysis by Walter D. Fisher and Leonard W. Schruben, *op. cit.*

[9] Richard A. King, *op. cit.*

solution. This solution is often referred to as an "optimum" solution of inputs and practices in terms of cost minimization. The solution will be optimum *only* if the formulation of the problem and data included contains the alternative which yields minimum cost. Linear programming merely selects the "optimum" from among a given variety of alternatives in a relatively direct and efficient manner.

A second problem area and one peculiarly adapted to this technique is that of combining enterprises into the total farm business in such fashion as to maximize net cash returns. Problems of this type subject to direct and swift attack by the technique are the area and individual farm adjustment problems brought on by involuntary acreage restrictions on wheat, cotton, corn, and other crops; the integration of livestock enterprises on farms; and the sensitivity of farm organizations to price and yield changes. Exploratory research in application of linear programming to this type of problem reveals its fruitfulness.[10] Opportunities to apply linear programming to this type of problem are unlimited. It is in this area that widest acceptance will undoubtedly take place, partly because of the relationship of this technique to budget analysis which has been the major tool in this problem area, and partly perhaps because its application is more easily understood in this problem setting. Procedures are being worked out at several experiment stations to process routine farm organization studies in this manner. Extension economists in several states have already recognized the possibilities of this approach in meeting the heavy demands of the individual farm analysis or farm and home planning program. Wider acceptance and application is expected and certainly warranted.

In this application care must be taken to discover and properly quantify the restrictive factors. Machinery capacities, soil capabilities, water availability, and quantities of labor and capital must be known and recognized. Knowledge of agricultural technology cannot be overstressed. The degree of refinement in defining restrictive factors must be dictated by the specific problem. Considering irrigation water availability in 2-week periods may be necessary when considering perishable crops in an arid area. It is best to err in the direction of too much refinement, other things being equal, than to produce erroneous results from overgeneralization. Likewise, input-output data for feasible alternatives must be accurate if

[10] Earl R. Swanson, and Kirk Fox, *op. cit.*, is an excellent illustration of the use of this technique in integrating livestock most profitably into the farm organization. The application of this technique to acreage adjustment problems on the individual farm brought about by allotment programs is demonstrated by Chester O. McCorkle, Jr., and James N. Boles, *op. cit.* Further application to this problem may be found in Chester O. McCorkle, Jr., *op. cit.*, forthcoming. The determination of the profit maximizing crop production program in accordance with soil type and resource ownership has been demonstrated by Bernard Bowlen, and Earl O. Heady, *op. cit.*

the true "optimum" results are to be obtained. In interpreting results, it is often necessary to adjust organizations slightly. This is usually due to a violation of the linear assumption concerning the profit function near the zero level of inputs in the process. Often the optimum program calls for a small acreage of a given crop. A small acreage may be impractical for a number of reasons such as contractual limitations in marketing or production, high overhead costs which might have to be assumed, or additional burdens on the operator's managerial resource for which due compensation may not be expected. For example, in analyzing farm organizations in California's cotton counties, sugar beets are often an alternative to cotton. These crops compete for summer irrigation water, both requiring large quantities during July. Cotton acreage continues to be irrigated later into the season and is generally limited in total by the diminishing late summer (August) water supply. The fact that a small additional supply of water is available during the month of July leads to the inclusion of a very small acreage of sugar beets in the optimum plan unless specific steps are taken to avoid its inclusion. This could be avoided by specifying a minimum sugar beet acreage in the restrictive factors or by assuming that no contract is available from the processor and thereby eliminating this alternative.

Optimum level of a factor input

A third problem—that of determining optimum level of a given input—is one that could be approached with linear programming but ordinarily little or no advantage accrues to its use. If it is a question of whether or not a given input is to be made (level here not being the question) then there is no problem beyond a simple comparison of changes in cost and return as derived from changes in output, product price, quantity of input and its cost. Where the question is one of what level to use and a choice exists, then marginal analysis is to be preferred, particularly if the production function is known or can be approximated. Partial budgeting in estimating an optimum input level is as effective as any technique if the production function is not completely identified, that is, where a series of point estimates are available but the complete function not specified. It must be recognized that while the conceptual solution to this problem using differentiation is obvious, lack of knowledge of the surface is the rule rather than the exception. Furthermore, restrictions in such factors as capital may rule out the optimum level of input for the individual producer.

Optimum resource use through time

A fourth area of application in farm management analysis that bears consideration is that of optimum resource use through time. This problem

is not distinctly different from the second, yet the added complications warrant special examination. Problems such as that posed by farm development where capital generation and further development are dependent on preceding improvements and their timing, are expected to be fruitful areas of application. A research project on the economics of improving brushland ranges in California contains aspects for which this methodology may be helpful. Brush clearance, reseeding, fertilizing, fencing, water, and trail development are the principal practices undertaken with a wide variety of combinations of practices, inputs and results possible. The added complication of how the range is utilized during this development period injects another set of alternatives. Although complicated, there is reason to believe that careful definition of processes (each process now being an entire sequence of processes jointly related) and the inclusion of sufficient numbers of alternative processes will specify a problem that may best be treated with linear programming. In this type of application especially, the conceptualizing process and the development of sound data are of extreme importance. Though a danger in any application, the consequences of omitting one economic or physical restriction might lead to particularly absurd results where the processes may be defined in periods of three to ten or more years. Added complications would arise in using discounted future net incomes in alternative programs. However, since the basic economic problem is the maximization of the present value of the income stream generated through a specified time period, the discounting problem cannot be dodged.

Applications of this technique other than to the problems of the individual farm firm bear mention though this paper is concerned primarily with the narrower application. Measurement of the economic impact of various agricultural policies and programs on a given segment of the farm population, or measurement of the probable direct impact of the adoption of new technology in a given segment of agriculture are problems to which linear programming can be applied. Persons conducting analyses of river basin developments, for example, may find this a helpful tool for some of the aggregative aspects of their investigations as well as for individual farm planning.

The use of linear programming in farm management should find application beyond research and extension as simpler computational procedures emerge. For example, agricultural lending agencies that supervise their borrowers in any degree, and other public and private organizations should find this technique of valuable assistance particularly as simpler computational techniques are devised. It is not inconceivable that, in the future, some form of linear programming will be employed by those charged with the management of large-scale commercial farming operations.

For all of these applications the basic technique of linear programming is applied in the same fashion. Selecting potentially profitable processes, selecting limitational factors and specifying the requirements of each process for the limitational factors, costing inputs and valuing outputs, and determining outputs are the basic decisions regardless of the type of problem being considered. As with any other research tool, the attention is thus directed to defining and formulating the problem, establishing the conceptual framework of analysis, selecting methods and finally gathering appropriate data. Thus, linear programming is merely a tool for treating a specified type of data in a well-defined setting. Given present experiences in the application of this technique in farm management analysis, it appears that its greatest use is in treating the resource allocation problem.

Advantages and Limitations of Linear Programming in Farm Management Analysis

The application of this mathematical procedure to a set of data appropriately selected and organized will choose the combination of inputs, practices, or enterprises (depending on the problem) that maximizes the net cash income or minimizes the net loss. If the optimum production plan for a given output is sought, the cost of producing that given output is minimized. If optimum allocation of a given set of resources is obtained, the net difference between total returns from the sale of products and the cash costs incurred in the production of those products is maximized within the quantitative and qualitative limitations imposed by the resources available. While marginal analysis will produce the same results, rarely are appropriate data available for this type of analysis.

Of particular interest to the economist utilizing this technique is one of the computational "by-products" obtained with no additional effort. Reference is made to the marginal value productivities of those resources which are limitational, estimates of which are obtained when treating resource allocation within a given producing unit. Their major value is as an indicator of how much the net cash revenue would be increased by the addition of one unit of the restrictive resource. A simple comparison of this value with the cost of obtaining the additional unit indicates whether or not this adjustment is feasible. The addition of one unit of a critical resource is not likely; however, this information is helpful in considering what changes in the pattern of fixed resources should be considered first.[11]

[11] Similar estimates are obtainable from regression analysis of total farm input-output data obtained from a number of farms. See Earl O. Heady, and Russell Shaw, *Resource Returns and Productivity Coefficients in Selected Farming Areas of Iowa, Montana and Alabama,* Agr. Exp. Sta., Iowa State College, Research Bulletin 425, April 1955. While either method derives values of the marginal products of the inputs, linear programming has the added advantage of indicating how to use the additional unit of a restricted resource.

A comparison of marginal value productivities derived in this manner with their theoretical counterparts is of interest. Resources limited in supply but not completely utilized in the final allocation possess a marginal productivity value of zero. Furthermore, the sum of the products of the marginal value productivities and their respective quantities employed exactly exhausts the total net cash return as calculated in the problem. Thus, the return is exactly allocated to the resources limited in quantity and which have positive marginal value productivities in the optimum allocation. Thus, this demonstrates conformity in characteristics of the marginal value productivities obtained in linear programming to those of marginal analysis.

A primary consideration of alternative organizations of farms in any area is their relative stability in the presence of price and yield fluctuations. Minor additional arithmetic with the optimum allocation will yield this type of information. Prices at which the individual farm operator would be indifferent to shifts in organization, other things being given, can be calculated. A comparison of these prices with historical price variation adjusted to a given level will indicate the degree of production, price, and income stability in any given agricultural area, particularly one wherein specialty crops are produced and where producers determine acreage at the beginning of each production period on the basis of price expectation. This procedure will indicate when changes in acreage and production might be expected, not when they will take place.

Other information obtained directly by this method is of interest to those engaged in farm management analysis. First, the net monetary sacrifice associated with the withdrawal of one acre of land from the optimum allocation to grow any of the alternative crops can be determined directly. Second, an inventory of surplus resources that are not completely utilized is available which may serve as a guide, along with the list of "bottlenecks," to consideration of long run adjustments in the organization.

The advantages of this method in getting results and its appeal to the research worker lie in the fact that this is a method that produces measures that can be compared with the conceptual measures found in his production models. Nevertheless, there are many complications and practical limitations that must be clearly recognized. The first question to be raised is "how acceptable are the linear assumptions?" Many competent economists are critical of any method that injects this type of restriction into research. Others, just as competent, feel that linear relationships fairly closely approximate the bulk of those found on farms. Expanding production on individual commercial farms can be viewed realistically as replicating basic combinations over a wide range of scale. Linear ex-

pansions in this type of agricultural production may be satisfactory. Yet, valid arguments exist for questioning linear functions. Other than constant returns to scale may exist (one argument often cited for discarding linear assumptions, but one lacking substantial empirical support). A more telling argument arises from the fact that factor and product prices may vary with quantities bought and sold, even to the individual producer. Contract purchase agreements between suppliers and individual producers for factors and products at prices varying with quantities purchased, particularly common on large scale farms in California, are disturbing. Quantity discounts for fuel, spray and dust materials, fertilizers, and other factors such as contracted services are common. Variable price contracts with such products as fluid milk, where the percentage of the milk bringing Grade A price varies during the season and from year to year, pose serious problems. This may be overcome, however, if one exercises care in defining the problem and processes. Linear segments, if properly defined, can closely approximate the actual relationships. Again it should be emphasized that linear assumptions are not unique to this one technique of analysis.

The fact that enterprises are not operated at "any positive level" bears on the proper definition of linear segments. Small acreages of some crops, particularly those grown under contract, are not feasible for reasons discussed previously. The necessity of knowing what factors affect organization and operation of farms under study, particularly those affecting sizes of enterprises, resource capacities, and production coefficients, is again emphasized.

Some have raised the question "is the assumption of independence adequately met?" Erroneously they have accused its advocates of overlooking the interrelationships among enterprises, inputs or practices. This is not a valid criticism of the technique as such. Care in defining processes to include the related enterprises, or practices, as a single and complete process independent of other processes renders this criticism invalid.

Another problem—homogeneity of resources, both among farms and within farms (or whatever resources are appropriate to the particular application)—cannot be put aside. Regardless of the homogeneity of the area from which the basic data are drawn, the data usually used in this type of analysis are average or modal results. As such they may not apply to any particular farm. Within a given farm the lack of homogeneity of the resources presents a complication, even when analyzing a specific farm as is done in many extension applications. The definition of more homogeneous limitational factors will help solve this problem but the price of this refinement whether in linear programming or budget analysis is an added computational burden.

A limitation of this technique, present as well in the budgetary method, is that it still abstracts from the total problem, whether it be organizational or any other aspect of the farm business. Markets, product and factor prices, and resources are all treated as subjective certainties within the minds of those making the analysis. Within this matrix of "givens" some value is maximized or some cost minimized. While we must recognize this abstraction, linear programming need not assume guilt beyond that of other techniques commonly employed in farm management analysis. Conventional methods of including variability whether adequate or not are available to the analyst willing to assume the additional burden.

After discussing some of the advantages and limitations of linear programming in farm management analysis, where should this tool be placed in the box? It is my opinion that it should be placed near the top where it can be reached when the frequently appearing problem of selection among a wide range of alternatives arises. In this use it should assume the position held so long by the budget method. For problems where choice is limited, budgeting may still be used. This is not a problem of discarding one technique for another but, rather, to add a new one to the growing list. The major results of a linear programming analysis can still be presented clearly in the form of a farm budget.

This tool is no panacea for farm management analysis! Field work, experimental evidence, and careful problem formulation are still the keys to successful farm management analysis. However, linear programming does provide a systematic means for processing data of the appropriate type.

Some Needed Research Relating to Linear Programming

The initial request for research relating to this area is certainly neither unique nor original. The wider use of the method does, however, focus attention on the need for better information on empirical physical production functions. Unless a wide number of alternative methods of achieving a given result can be quantified, linear programming can lay no claim to an "optimum" solution to any given problem, particularly to farm organization problems. Perhaps the wider acceptance of this method will enable research workers to spend more time in developing adequate input-output data and less on routine calculations.

Further research is needed in dealing with the problem of uncertainty. For example, in using this technique in farm adjustment research one of the problems causing the most difficulty has been that of selecting prices of alternatives to a crop undergoing involuntary acreage reduction. Realized prices will be determined in large part by the responses that farmers as a group make to the modified institutional environment. The injection

of restrictions on income variability represents an attempt to approach the problem of uncertainty which continues to be one of the most difficult to handle in economic planning. For some types of planning problems in agriculture, uncertainty is comparatively limited, particularly when the production period is very short, input-output relationships well known, and where elaborate steps have been taken to augment or modify the natural determinants of production. Other types of agriculture do not fare so well. For this group a stochastic model for linear programming yielding expected values and estimates of the variation subject to probability statements is essential. An excellent explanation and example of the introduction of variation in input coefficients and resultant output estimates to which probability statements have been attached has been prepared at Iowa State College.[12]

As wider use is made of linear programming in the analysis of farm management problems, more problems of sufficient complexity to preclude the simple computational procedures will become common. Further introductions of electronic computing equipment will offer additional opportunities to attack such problems. It is necessary, therefore, that a broader understanding be had of how these problems are adapted for different types of computing equipment. Procedures used by research groups in other scientific fields may provide a fertile source of ideas and experience.

It is the author's opinion that further empirical application of linear programming is required before final evaluation of the technique can take place. Only its application will reveal fully its weaknesses and strengths in alternative problem settings.

---

[12] M. M. Babbar, Gerhard Tintner and Earl O. Heady, "Programming with Consideration of Variations in Input Coefficients," *Journal of Farm Economics*, Vol. XXXVII, No. 2, May 1955.

ACTIVITY ANALYSIS:[1] AN AGRICULTURAL MARKETING TOOL[2]

CHARLES E. FRENCH[3]
Purdue University

TREATMENT of the algebraic mechanics of activity analysis are now available.[4] Fortunately, too, these treatments are comprehensible by the mathematically unwashed. Thus, this paper will not discuss mechanics. It will attempt to show for agricultural marketing the import of the assumptions of activity analysis and orientation dictated for this tool by its own assumptions.

A Word About the Technique Itself

The basic economic problem of allocating scarce resources so as to maximize the ends embodied in some predetermined objective has not been changed by activity analysis. Thus, the usual assumption of measurable means of maximization must still vex the economist in light of the growing shroud of doubt generated by psychic considerations. Neither has activity analysis supplanted marginal analysis as the standard formulation of this type of problem. Rather, activity analysis is a refinement of marginal analysis or at least a supplement that seems to have advantages for many of the practical problems of today. To say which of the two—marginal or activity analysis—is the genus and which the species seems unnecessary.

---

[1] The author refuses to engage in prolonged semantic discussions about the title of this paper. However, the term, "activity analysis," is used purposely to eliminate the restricted inference of other terms such as "linear programming." The reasoning for this is much the same as that stated in *Activity Analysis of Production and Allocation*, Editor, T. C. Koopmans, New York (1951), pp. 5-7.

[2] Purdue University Journal Paper No. 894, approved for publication July 26, 1955.

[3] The author expresses appreciation to his colleagues, especially Earl Kehrberg and James Snyder from Purdue, for suggestions on this paper.

[4] See for example, Robert Dorfman, "Mathematical, or 'Linear' Programming: A Non-mathematical Exposition," *The American Economic Review*, Volume XLIII, December, 1953, pp. 797-825.

Alexander Henderson, and Robert Schlaifer, "Mathematical Programming: Better Information for Better Decision Making," *Harvard Business Review*, May-June, 1954, pp. 73-100.

T. C. Koopmans, Editor, *Activity Analysis of Production and Allocation*, New York (1951), especially Chapter XXI.

A. Charnes, W. W. Cooper, and A. Henderson, *An Introduction to Linear Programming*, New York (1953).

Robert Dorfman, *Application of Linear Programming to the Theory of the Firm*, Berkeley (1951).

E. O. Heady, "Simplified Presentation and Logical Aspects of Linear Programming Technique," *Journal of Farm Economics*, Dec. 1954, pp. 1035-1048.

J. N. Boles, "Linear Programming and Farm Management Analysis," *Journal of Farm Economics*, February 1955, pp. 1-24.

Such an approach was bound to merit serious consideration. Economists have long been somewhat chagrined that marginal analysis has so often failed to impress men of affairs on practical problems.[5] Such has probably been the case even more with marketing problems than with farm management problems.[6] Also, this criticism is levelled more in the field of short run entrepreneurial decisions than in that of long run ones. Thus, the imposing number of short run marketing problems lends credulity to the ear given activity analysis.

The mathematical form of activity analysis is the maximizing of a linear function subject to linear inequalities. The economic substance of most of these problems is the fact that a group of limited resources must be shared among a number of competing demands, and all decisions are "interlocking" because they all have to be made under a common set of fixed limits.[7]

Activity analysis cannot answer all things. At last year's meeting some cautioned that the method might be getting too much acclaim. Query revealed that their cry was not to discredit the technique but merely to put it in proper prospective. This seems prudent. Dorfman[8] has said, "No mathematical model simple enough to be manageable can reflect adequately the intricate blundering decision making process of the real economic world." Thus, we will probably need be satisfied with the conclusion of Henderson and Schlaifer[9] that, "Mathematical programming cannot replace judgment, but it can supply some of the factual information that management needs in order to make judgment."[10]

Generally, the technique must select optimum alternatives for a manager who must operate with an inherited bundle of production resources left somewhat obsolete by tardy adjustment to rapidly changing technology. I strongly suspect that this is the most pressing problem of farm and business manager alike. The technique may be used on some planning problems where all resource choices are open, but these problems are probably exceptions.

[5] See Robert Dorfman, *Application of Linear Programming to the Theory of the Firm*, Berkeley (1951), pp. 1-22, and J. W. Wiley, "The Contrast Between Break Even Point and Marginal Cost-Marginal Revenue Analysis," Paper given before the Indiana Academy of Social Sciences, October 3, 1953.

[6] Joseph Clawson, "Is Marginal Utility Measurement the Key To A Comprehensive Theory in Marketing," Harvard University Studies in Marketing Farm Products Number 9-H, June 1954.

[7] Henderson and Schlaifer, *op. cit.*, p. 74.

[8] Robert Dorfman, *Application of Linear Programming to the Theory of the Firm*, Berkeley (1951), p. 80.

[9] Henderson and Schlaifer, *op. cit.*, p. 82.

[10] For two interesting articles on the broad aspects of this problem, see D. M. Mackey, "Comparing the Brain with Machines," *American Scientist*, April 1954, pp. 261-268; and D. J. Ingle, "Psychological Barriers in Research," *American Scientist*, April 1954, pp. 283-293.

Specific guidance suggests use of the tool for problems of selecting among a finite number of qualitatively different alternative enterprises or processes when the problem is "large scale." Heady[11] has probably rightly suggested that the budget is best for this type of problem when it is "small scale." Marginal analysis is probably still the most fruitful problem formulation for many of the infinitesimal and quantitative questions dealing with minor production practices. Either activity analysis or marginal analysis can solve either of these problems. Thus, we should consider these recommended applications as points of departure only.[12] Also, to some degree marginal analysis emphasizes long run static conditions, and activity analysis emphasizes short run, dynamic conditions. Activity analysis can nearly be likened to a salvage operation, useful to managers keeping up with today's technological treadmill.

Assumptions Necessary

Most assumptions of activity analysis at the present stage of development fit comfortably in the following classification:

a. *Linearity.*
b. *Divisibility.*
c. *Additivity.*
d. *Finiteness.*[13]

Permeating all of these assumptions is the idea of a process. Actually, the *raison d'etre* of activity analysis is the process. The above assumptions apply *to the process. The problem itself* may have curvilinear or indivisible aspects. By formulation into alternative processes, the problem is solved, despite its over-all characteristics. Understanding this is fundamental to understanding activity analysis.

Technically, the process involves "one, or more functional relationships in which all the inputs and outputs enter as dependent variables and there is only one independent variable, the 'level' of the process."[14] Practically, process merely means a particular way of getting an economic job done. For example, in cottonseed oil mills, processes have been defined as: hydraulic, screw press, direct solvent, and prepress solvent.[15] Each

[11] E. O. Heady, "Simplified Presentation and Logical Aspects of Linear Programming Technique," *Journal of Farm Economics*, Dec. 1954, p. 1035.

[12] For an excellent development of this point, see Robert Dorfman, *Application of Linear Programming to the Theory of the Firm*, Berkeley (1951), pp. 84-85.

[13] *Ibid.*, p. 81. Such classification does not imply that these are independent postulates. Possible interdependence is recognized, but the classification seems a useful one.

[14] *Ibid.*, p. 93.

[15] J. M. Brewster, "More Economical Cottonseed Oil Mills and Returns to Growers," *Journal of Farm Economics*, August 1954, p. 428.

of these processes requires a different bundle of production factors. Variations in each of these processes, if occurring, could be treated as additional processes. In our work J. C. Snyder and I found it feasible to select for a fluid milk plant a group of processes each of which resulted in a different product, such as wholesale distribution of milk in paper, one-half gallon containers; wholesale distribution in glass, gallon jugs; retail distribution in glass, quart containers; etc. We selected only one prevailing process for producing each product. However, further study anticipates adding alternative processes for each product. For example, a different type of gallon bottling machine might be introduced.

The idea of the process or activity involves a particular, complete way of getting a job done. It is a departure from our common way of thinking of absolute divisibility and substitution of individual factors of production one for the other. The smooth production opportunity or transformation curve has now become a broken line with special significance to the angles involved.

Activity analysis exploration is seemingly timely for marketing studies. Food industries have traditionally lagged in industrialization. Only in relatively recent times have marketing innovations necessitated large scale substitution of complete new processes. For example, practical commercial freezing methods were of little use until new processes of transportation, storage, distribution, and consumer handling evolved. Bulk handling, so dynamic in changing heavy industry, is being retarded in agricultural marketing until process adjustments come in farm organization; transportation equipment design; work methods of warehouses, elevators, feed mills, and fertilizer plants; receiving point unloading facilities; consumer buying practices; and organizational policies. Continuous food manufacturing processes, self service distribution, quality control, waste disposal, and numerous other marketing changes are making for extensive process substitutions. Automation will call for even more.

Linearity Assumed. This means that input factors combine in fixed proportions at all levels of output. Also, output will vary in fixed proportions with any given input, and thus, we have neither economies nor diseconomies of scale in the use of a given process. Traditional economic eyebrows rise at these assumptions. Actually, these assumptions need not delimit the activity analysis researcher below a normal work week.

My initial exposure to the first assumption was in the "law of definite proportions" in chemistry. This meant simply that two atoms of hydrogen would combine with only one of oxygen regardless of the number of atoms of either available. Such assumption finds a friendly atmosphere in marketing. Many marketing processes are based directly upon chemi-

cal, mechanical, or physical relations of just this type.[16] Automation suggests a myriad of examples.

The environmental control in marketing should yield us greater accuracy in attaining this assumption than will ever be possible in farm management—even with air-conditioned animal structures! In addition to controlled plant processes, transportation rates tend to conform closely to this assumption. Rising cost of space suggests a group of problems here that will conform naturally. Plant location problems arising out of distribution and transportation innovations should fit rather well here where costs of utilities, transportation, space, etc., are involved. Current trends toward stabilized wage rates, job rating and evaluation systems will tend to make labor problems conform more and more to this assumption.

The second assumption of linearity, that the ratio of output to a given input will remain constant regardless of process scale, is slightly more troublesome, but not prohibitive. Changes in scale themselves do not cause curvilinear production functions. Curvilinearity generated by changes among input factors can be consistent with constant returns to scale assumed in activity analysis. In activity analysis, process substitution directly accounts for the traditional curvature of the production surface. Substitution of input for input is accounted for indirectly.[17]

Inclusion of fiixed costs, too often arbitrarily allocated, cause many problems is curvilinearity. Activity analysis will show maximum return possible to a set of fixed factors, both restrictive and nonrestrictive. Often this seems to shun a large part of the management problem. Yet, it seems more useful to give the correct answer for this part of the problem than to clutter the whole thing with arbitrariness. Effectiveness of the tool here seems promising, indeed.

Businessmen have illustrated repeatedly that they do not worry much about curvilinearity in short run decisions. Witness the common usage of the so-called payback concept for capital expenditure. Farm and business

[16] Marketing workers might take heed of farm management workers' caution to strive for "practical" coefficients rather than to assume for example, that chemical relationships are the same as, for example, nutrition values. (See W. D. Fisher, and L. L. Schruben, "Linear Programming Applied to Feed-Mixing Under Different Price Conditions," *Journal of Farm Economics,* November 1953, p. 478.) J. C. Snyder and the author concluded that a gross type of storage space coefficient meant more than one based only on size of storage case in dairy plant studies much as Warren's example that what went into the manger was more important to the farmer than what went into the cow (see S. W. Warren, Discussion of John C. Redman's paper, *Journal of Farm Economics,* December 1954, p. 1033).

[17] Dorfman develops this point well, substantiating it with work of Knight, Koopmans, and Samuelson. Robert Dorfman, *Application of Linear Programming to the Theory of the Firm,* Berkeley (1951), pp. 81-82 and "Mathematical, or 'Linear,' Programming: A Nonmathematical Exposition," *American Economic Review,* December 1953, pp. 808-810.

managers have traditionally argued over methods of depreciating, for example, labor saving equipment. Businessmen will almost invariably insist that it be paid for out of operating capital. Farm manager and agricultural economist will depreciate it over long periods. Witness, also, common usage of the break even analysis concept in industry. The essence of break even charts is linearity. Their popularity continues to increase, however.[18] Business accounting manuals seldom dwell on curvilinearity.

Activity analysis is based upon the fundamental idea that factor ratios represent the amount of a factor which is *used* not the amount *owned.* Economies of scale analyses have often considered the amount of goods owned not the amount used. Again my chemistry taught me that best results often required that we have some elements left over. Tardy adjustments of production facilities to technology may suggest a sensible analogy in our economic problems. Traditionally we have thought of excess capacity of an individual production factor as a cardinal economic sin. Activity analysis may show that we were not as sinful as we thought.

Linear approximations of appropriate sections of curvilinear production functions are adequate for most answers plausible from data available. Each applicable approximation is handled merely as a new process. The idea of using a separate process for overtime labor or supplemental storage space, for example, may let us expand such fields of analysis rather than force us to restrict them. This points up again the necessity of better defining the nature of production surfaces.

Any remaining circumscription of our analytical sphere attributable to these assumptions of linearity is temporary. The mechanics of handling curvilinear relationships directly are being refined and simplified rapidly. More work is needed here, but it will be forthcoming.

Many marketing problems such as those dealing with machine capacity, manpower requirements, full employment output, space, transportation, location, scheduling, seasonality, or inventory seem to present no special problems in regard to this assumption.

Divisibility Assumed. I can see no particular problem with this assumption in agricultural marketing problems. Process inputs are of three types: producers' nondurable goods entirely consumed in the process, services of individuals and outside firms, and services of capital equipment owned by the firm itself.[19] Few examples of gross indivisibility of these should be found in agricultural marketing. Some raw material contracts and possibly service payments such as for consulting might be problems. However, in most cases a new process ray will take care of the situation.

[18] See Wiley, *loc. cit.*

[19] Robert Dorfman, *Application of Linear Programming to the Theory of the Firm,* Berkeley (1951), p. 83.

Output of most marketing institutions is divisible. One-half case of milk or loaf of bread should create no special problem. Less than carload lots, for example, can be handled as a special process. Minimum market requirements can be specified and handled by the method if necessary. Remember also that we have not assumed away managements' use of judgment in such cases.

Additivity Assumed. This merely says that we can add two different processes just as we said we could duplicate the same process. Obviously, some processes as now conceived are not additive. For example, some food processes may need be integrated because quality will be damaged by successive replacement and removal from refrigerated storage. However, process integration of this type may be handled as one process rather than as a group of successive processes. Many traditional processes will not violate this assumption, however.

Excess capacity of marketing firms has been established in many cases. A good businessman will usually reply that his company obviously added a new product in order to spread sales overhead. However, my observations have been that more sales overhead is usually added quickly to the increased product line and before long we have merely duplicated the old process or have added a complete new one. Thus, the assumption of additivity is not violated except in the very short run. Process complementarity is merely reduced to process duplication. The general tendency to carry division of labor too far in many processing plants almost invariably gives this result. Tendency toward unionization and increased mechanization will probably reduce the restrictions of this assumption. Also, many of the factors in excess that could apparently result in nonadditive processes will in my opinion never become limiting and these can be assumed out of many short run problems.

In our studies of fluid milk plants, we found additivity often assumed in practical operating situations such as for paper or glass bottling processes. Witness, for example, systems of production factor modifiers such as the ones used by the Bureau of Markets in California. Also, actual plant surveys such as the one by Williams in Alabama[20] showed paper and glass to be additive. However, the synthetic study of Conner, *et al.*[21] found paper and glass processes to be nonadditive. Consumer satisfaction with a diversified product line is probably more important here than efficiency gained by nonadditive processes. Activity analysis can even be effective on this type of problem by handling market situations as if they were pro-

[20] Sheldon W. Williams, "Costs and Returns to Alabama Milk Distributors," Alabama Polytechnic Institute Bul. 287. June 1953.

[21] M. C. Conner, *et al.*, "Specifications and Costs for A Milk Pasteurizing and Bottling Plant," Northeast Reg. Pub. No. 16, 1952.

duction factor restrictions. The additivity assumption may be restricting on some marketing problems, but not on the majority.

Finiteness Assumed. Anyone who has done economic-engineering analysis has felt the apparent uniqueness of each work method or piece of equipment as he attempted classification. Yet our work has taught us that practical classification is possible and finiteness can be approached. As we gain input-output data, and sharpen our concept of the process, this assumption will be less worrisome. However, at present we must grapple with it.

Selection of proper processes means that sampling will be a problem for activity analysis. This is not new for marketing research. I have been uncomfortable in defending judgment samples or case studies on other occasions, but I expect activity analysis will call for even more.[22] With activity analysis we admittedly get the "one best budget." Yet, I suspect that proper selection of processes may be more important in many cases than attainment of the "one best budget." Apparently, farm management researchers must fear the same thing.[23]

On the other hand, Ray Bressler feels that alternative marketing processes are often so few that in many situations sampling will be no problem. Neither will we need the sophistication of this approach to get at the answer.[24] I would tend to agree that this is true where complete process description and quantitative measurements are available. Yet, I am afraid that most of our research will need to continue on fairly small parts of the problem and there the variations can be numerous. I have never been able to reduce the number of feasible alternative processes to the obvious without some difficulty. As a matter of fact, I have always felt that just "discovering" the newer processes being used by our efficient managers and then telling our poorer managers about them was a service. After all, farm management researchers by this very technique built much of our early professional reputation. Ricardo would probably have found activity analysis little more effective than marginal analysis because his alternative processes in the early nineteenth century English wheat production were definitely limited. Ours are too in some situations, but in many cases I fear they more nearly approximate the infinite than the finite.[25]

[22] C. E. French, "Sampling Dairy Plants to Study Efficiency of Receiving Room Operations," *Proceedings Marketing Research Workshop*, July 1950, pp. 81-90.

[23] J. S. Plaxico, Discussion of paper by E. O. Heady, "Simplified Presentation and Logical Aspects of Linear Programming Technique," *Journal of Farm Economics*, December 1954, p. 1049.

[24] Letter to author, June 16, 1955.

[25] I grant that I may be defining process in too narrow a sense. Fully I realize that we have tried to answer some problems with a stopwatch when our time would have been better spent by appraisal of scale, machinery specifications, or building plans.

Assumed finiteness immediately prompts questions concerning time. This has been our most worrisome problem with activity analysis. Obviously, a finite number of processes today can become an infinite number over time. Yet, an alert researcher with an eye for the practical can guess along with the manager as to which inventions will become innovations. This is a continuing problem, but one for which activity analysis probably adds little or takes little away. Possibly, the efficiency of our computational machines will let us test more of these new "processes" sooner than has been possible in the past.

The more troublesome time question involves the nature of the supply curves in activity analysis. Typically, production factors are divided into two groups: unlimited factors available in any amount at a constant unit cost[26] and limited factors which are obtainable at a constant unit cost (usually zero) to a point and then unavailable at any cost. Hicks explains well the origin of these limited factors:

> The entrepreneur already has under his control a complex of goods, the equipment of the firm. Equipment includes land, buildings, machinery, tools, raw materials, goods in process, goods technically finished but not yet sold. Now it does seem reasonable to assume that this equipment will have acquired some organic unity, so that it cannot be exactly reduplicated at a moment's notice. It is the firm's legacy from the past, and, as such, does seem to constitute a block of "fixed resources" in the relevant sense.[27]

Dorfman[28] suggests that the permanent and integrated staff of the establishment be added to Hicks' catalogue of fixed resources.

Thus, what is limited and what isn't, and over what time period? This will test the ingenuity of the marketing researcher. Using labor, for an example, you must determine degree of skill, normal training, contract restrictions, immobility due to building design, turnover, etc. Again the technique will give an answer in terms of return to a lump of fixed factors. Management can then make the decision within this group with better information than when an arbitrary allocation clouds the picture on the *obviously limiting* group, which can be properly allocated.[29]

Activity analysis is probably best suited to short run problems but it is not limited to them. Fortunately the dual solution necessary for activity analysis yields as a by-product marginal values of each of the factors in

---

However, I feel that activity analysis can handle many of these minor problems, and such problems must be answered before the total production scheme can be defined and quantified.

[26] Admittedly, cost may vary with quantity obtained; however, this again is handled by adding a new process for each cost bracket.

[27] J. R. Hicks, *Value and Capital*, Oxford (1941), pp. 199-200.

[28] Robert Dorfman, *Application of Activity Analysis to the Theory of the Firm*, Berkeley (1951), p. 86.

[29] See Henderson and Schlaifer, *op. cit.*, pp. 79-82.

limited supply. Thus, a manager has these for his long run plans. We should be cautious in the use of these, however. Our curves now are not smooth but rather broken lines. Sharp breaks or gaps in the marginal curves are the rule rather than the exception. It is possible to program a forecasted process change that will give a good estimation of long range plans. J. C. Snyder and the author worked with an interesting problem of this type. Since fat and skim are usually bought as joint products in fluid milk plants, it was interesting to lower the butterfat content of the milk and determine variation in product mix. This might represent to a degree a situation that could develop if butterfat test continues to drop as a result of shifts in value of fat relative to skim.

Problems of using estimated prices and demand in budgets are not eliminated in activity analysis. Most agricultural applications of activity analysis to date are vulnerable to severe criticism because of prices and demands assumed. Price situations may be easier to predict in marketing problems than in farm problems, but demand situations will probably give greater concern. This is a real difference between farm and marketing applications. Yet, the flexibility of the approach will probably let us establish much better ranges on problems of this type than was possible with other techniques. Many demand studies suggest use of the approach. Possibilities here will grow as techniques are refined.

Obviously the approach takes a vast amount of detailed and accurate basic input-output data. Marketing data may better conform than farm management data. However, our experience in making use of secondary data in fluid milk analyses was not good. We were able to use some, but a disappointingly small amount. Possibly, access to consultant engineering data, such as available to the Northeast Regional Dairy Marketing group, would be more fruitful.[30] Yet, I am afraid that the input-output data already available in marketing are generally inadequate for this approach.

Implied in the basic assumptions is a high degree of certainty. Market and technological uncertainties do delimit the use of the approach. Both because of lag in collection of good input-output data and "intangibles" in entrepreneurial decision making, a critical need exists for development of appropriate stochastic models. Babbar, Tintner, and Heady[31] have made a start in this direction. More work to handle uncertainty, particularly in the technological area will come. In the area of market uncertainty, we are apparently no more restricted with activity analysis than with most other approaches.

---

[30] Conner, *et al., loc. cit.*

[31] M. M. Babbar, Gerhard Tintner, and E. O. Heady, "Programming With Consideration of Variations in Input Coeffiicients," *Journal of Farm Economics*, May 1955, pp. 333-341.

Applications

Agricultural marketing applications of activity analysis are relatively few. Yet, a start has been made. Time will not let us look at all of these in detail, but I will enumerate some with which I am familiar.

At Purdue, we are completing a study of a fluid milk processing plant. We are interested in determining optimum product mix with a set of fixed resources, some 25 of which we believe may be limiting under different conditions. We have 20 possible products or processes. We believe we have demonstrated the applicability of the approach, and hope that we can make some general plant recommendations. Some twenty-odd situations were examined. We plan to continue work in this area, expanding process variations, plant sizes, market situations, etc. Also, meat packing has been studied to select between alternatives of selling "green" or "cured" products.[32] We hope to use the approach on an intermarket competitive study of the dairy industry emphasizing institutional or market restrictions.

Fred Waugh[33] has solved an interesting problem in connection with awarding contracts for the school lunch program. This had the typical characteristics of the transportation-type problem, except that the amount bought at each shipping point was unknown. This depended upon the relative bids. This suggests a whole array of variations in transportation problems vital to agricultural marketing.

George Judge has solved a useful transportation problem involving the optimum means of moving eggs from surplus to deficit areas.[34] Several variations of the model were investigated.

Also, Judge and Jim Plaxico are planning a study of optimum location and organization of individual livestock marketing firms.

Earl Swanson has illustrated how the technique can treat the problem of mixing fertilizers.[35] The work of Waugh[36] and particularly that of Walter Fisher and Leonard Schruben[37] has demonstrated usefulness of the approach in feed-mix problems. More work is needed in these areas.

Paul Kelley and Henry Tucker plan to do work on optimum plant organization and product mix of dairy manufacturing plants. Here balancing

[32] K. A. Chatto, "An Application of Operations Research Methods to the Selection of a Processing Plan in a Meat Packing Plant," unpublished Master's thesis, Purdue University, June 1955.

[33] Reported to the author in letter of June 27, 1955.

[34] To be published soon as Connecticut Bulletin. G. G. Judge, "Competitive Position of the Connecticut Poultry Industry: 7. A Spatial Equilibrium Model for Eggs."

[35] E. R. Swanson, "Minimizing the Ingredient Cost of Fertilizer Mixes," Research Report AERR-8, University of Illinois, May 1955.

[36] F. V. Waugh, "The Minimum-Cost Dairy Feed," *Journal of Farm Economics*, August 1951, pp. 299-310.

[37] Fisher and Schruben, *op. cit.*, pp. 471-483.

price flexibility against processing efficiency should present an extremely challenging problem.

Industrial applications of activity analysis are now being reported regularly. Henderson and Schlaifer[38] have given an excellent illustrative survey of different problems being solved. Management consultants have been working on a range of problems. The Methods Engineering Council, for example, has worked on problems of product mix, where to buy and where to make parts, inventory, methods improvement, scheduling orders, location, seasonality of sales with fixed labor force, and where to produce.[39] These organizations are also adding simplicity and refinement to the method.[40]

Other applications suggest themselves. The whole area of procurement seems fertile. Bulk milk pickup, for instance, has an intriguing set of interlocking management decisions. Transportation differentials in marketing orders, price differentials between livestock markets, interregional competition, government program buying and storing, empty railroad car routing,[41] truck fleet scheduling, labor employment and placement (especially migrant), and many others are suggestive of appropriate problems.

Manufacturing and processing suggest a wide range of problems. Space and labor method compromises could use the tool.[42] War uses where minimizing time was of essence suggests a range of labor utilization problems. Clerical and administrative processes, long overdue for evaluation, suggest the method. Work on seasonality already done[43] and promise of new tools for analyzing sequential events may give us a toehold in another neglected area.

Distribution studies will find some uses. Meat packer planning boards have worried with many typical problems of this type. The flexibility of the tool suggests it may have usefulness in studying impact of institutional marketing policies. If we can ever supplement it with practical application of the theory of games, we might invade this area of un-

---

[38] Henderson and Schlaifer, *op. cit.*, pp. 73-100.

[39] R. O. Ferguson, Address given at Industrial Engineering Conference, April 21, 1955, Purdue University.

[40] R. O. Ferguson, "Linear Programming," *American Machinist*, April 11, 1955, pp. 120-136.

[41] R. O. Ferguson, "High-level Railroad Cooperation, Plus Operations Research Methods Equals More Efficient Railroading," *Railway Age*, April 20, 1953, pp. 71-76.

[42] A problem such as the one reported by A. B. Lowsteter, *et al.*, "The Comparative Efficiency of Various Arrangements of Railroad Tracks at Stores in Wholesale Produce Markets," USDA, Agricultural Information Bulletin 55, June 1951, might well lend itself to this approach.

[43] *Management Topics*, March-April 1955, Published by Methods Engineering Council, Pittsburgh 21, Pennsylvania.

known. The whole area of demand shifts and elasticity studies will furnish suitable problems. Quality problems can also be handled.[44]

Some classify the tool as a firm tool, or at best, a micro tool. Others are more enthusiastic that it is a macro tool. Such classification does not interest me much. Supply of problems far exceeds the resources available to answer them. However, as a suggestion of macro problems, possibly the production and marketing workers should in combination use the approach to answer the accusation that our marketing systems are failing to keep production and consumption in balance. Also, foreign trade problems, especially in their conflict with domestic price support programs, might find the tool effective. Work will continue on broad problems such as industry interdependence, business cycles, and government policy.

This paper has emphasized the use of activity analysis as a research tool. Activity analysis is demandingly practical. Answers should be of the type and in a form quite useful in extension teaching. Also, classroom students have repeatedly been critical of the abstract presentation of marginal analysis. Thus, this formulation may be more pleasing to their palates.

Conclusions

As for activity analysis as an agricultural marketing tool, we can conclude the following:

(1) It is no panacea, but deserves more use than it has had.
(2) It need not supplant marginal analysis, but will add to it.
(3) It is inherently practical and flexible despite fixed assumptions.
(4) It adds precision to our analyses by selecting the optimum budget.
(5) It may well become more and more useful due to present technological trends.
(6) It allows routines which will relegate to clerks some chores now using managerial and researcher time.
(7) It may make for more precise problem formulation.
(8) It may result in better data preparation—a much needed improvement.
(9) It will yield some marginal cost data for long run planning.
(10) It will increase sampling problems.
(11) It will concentrate more marketing research on short run problems.
(12) It will cause re-examination of prevailing methods of problem formulation.
(13) It will yield research results in form ready for extension teaching.
(14) It will be easier to teach in the classroom than is marginal analysis.
(15) It will live or die by its test on practical problems of importance.

[44] Robert Dorfman, "Mathematical, or 'Linear,' Programming: A Non-mathematical Exposition," *American Economic Review*, December 1953, p. 821.

INTEGRATING CROP AND LIVESTOCK ACTIVITIES IN FARM MANAGEMENT ACTIVITY ANALYSIS

EARL R. SWANSON
University of Illinois

REALISTIC planning of a farm operation containing both livestock and crop enterprises is a complex task. Conventional budgeting usually starts with the consideration of the "best" use of some single resource. In the Corn Belt the focus has traditionally been on land use. In other areas, the budgeting procedure may center about labor or capital use. If the procedure is land use oriented, a cropping system is usually selected in the initial stages. Then livestock is added to use resources not fully utilized, in some sense, by the cropping system. These resources are frequently roughage and labor. However, the interrelations between the cropping system and the livestock system are such that to permit inclusion of desired livestock (desired because it is believed they will increase profits), it may be necessary to adjust the previously selected cropping system to the livestock system. In short, conventional budgeting must proceed piecemeal by considering in sequence each part of the farm business; simultaneous consideration of the specified available resources and the alternative products is not possible.

In contrast, activity analysis or linear programming permits the simultaneous consideration of a number of activities or enterprises together with their interrelations and their demands on the available resources. The difficult problem of placing explicit values on resources not priced in the market is obviated in activity analysis. Once the relationships among activities have been specified and the criterion for selection established, we may proceed rather mechanically to the optimum solution. Partial or enterprise analysis of crops and livestock out of context of the total farm business is very difficult because the appropriate rates to charge resources having more than one use are their opportunity costs. Opportunity cost in terms of the marginal productivity of a resource in another enterprise is not easy to determine. The implicit pricing of these resources may be accomplished in activity analysis.

Activity analysis is more useful in situations such as the development of a farm plan embracing both crops and livestock than in, say, developing a plan for a single crop-farm situation. In addition to the ability to handle more complex situations, activity analysis insures the highest profit solution within the conditions specified in the formulation of the problem. Conventional budgeting can compare only the results of the budgets developed; budgets not considered may exist which are more profitable.

The complete range of possibilities within the situation specified is considered by the activity analysis technique.

The two methods have certain common limitations which should be briefly mentioned. Both suffer frequently from lack of adequate data. Activity analysis does not improve on basic technical coefficients although it does perhaps utilize them more fully and rigorously, and in so doing may show their deficiencies more readily than is true with conventional budgeting. Satisfactory methods for handling uncertainty have not yet been developed for either method.

To discuss the application of activity analysis in integrating crop and livestock systems a rather simple model will be used to facilitate the exposition.[1] The model should be viewed only as suggestive of the possibilities of activity analysis in its particular application to a crop-livestock farm. Other refinements could, of course, be incorporated into the model. Such refinements are dictated by the situation considered, and are usually not a limitation of activity analysis itself.

The specific emphasis in the model presented is that it attempts to deal with problems of planning over time. That is, more than one period of production is considered. A monoperiod model of crop rotations and livestock enterprises has been treated by Peterson.[2] We might view the model presented in this paper as the development of a long run farm plan with a transition plan also specified. The model will be presented in four parts. First, the activities or processes will be presented. Second, the restraints or resource supplies that must be considered as limits on profit maximization are presented. These restraints, in essence, describe the farm situation being programmed. Third, we introduce the criterion relation that provides the basis for selection of the plan. Finally, results are presented.

The farm situation considered is that of an owner-operator on 320 acres of Muscatine Silt Loam, 20 acreas of which are in permanent pasture. He wishes to initiate a plan starting in 1956. His relevant horizon for discounting is five years. However, a plan is desired that would permit a slightly different type of operation in 1956 than in the succeeding years 1957 through 1960. Thus we may look at the 1956 plan as the transition plan. Currently there is no livestock on the farm. A full complement of crop machinery is available with the exception of a grain combine. The labor supply consists of two full-time men together with a boy during the summer months.

---

[1] Technical coefficients or planning standards used are based on Illinois Farm and Home Development Reference Book, University of Illinois, College of Agriculture, January 1955.

[2] G. A. Peterson, "Selection of Maximum Profit Combinations of Livestock Enterprises and Crop Rotations," *Journal of Farm Economics* 37: 546-554, August 1955.

Activities Considered

The first six activities are cropping systems. A cropping system is defined as a combination of a rotation and a fertilizer program. Soil tests indicate a limestone requirement of three tons per acre for satisfactory legume stands and that the available phosphate is "low." Potash is adequate for the yields contemplated. Two rotations are considered as alternatives: corn-corn-oats (with clover catch-crop) and corn-corn-oats-clover. The phosphate programs considered are essentially the same for both rotations.[3] A "buildup" is accomplished starting in 1956 by the use of a combination of rock and superphosphate. A maintenance program is initiated on the three-year rotation at the beginning of the fifth year; on the four-year rotation at the beginning of the sixth year. Hence at the end of five years the phosphate levels of both rotations are assumed to be the same. With respect to nitrogen, three levels are considered for each rotation. Care was taken in allocating nitrogen among crops within the activity to insure equimarginal returns within the activity. Since each combination of rotation and nitrogen level is treated as a separate process or activity, we may define the levels of the first six activities as follows:

x_1 = acres of corn-corn-oats (cl) with 85 bushel corn yield
x_2 = acres of corn-corn-oats (cl) with 75 bushel corn yield
x_3 = acres of corn-corn-oats (cl) with 65 bushel corn yield
x_4 = acres of corn-corn-oats-clover with 90 bushel corn yield
x_5 = acres of corn-corn-oats-clover with 80 bushel corn yield
x_6 = acres of corn-corn-oats-clover with 70 bushel corn yield

The next three activities deal with the hog enterprise. A two-litter system is considered with three levels of protein. Thus the three activities are identical with the exception of their corn and protein requirements.[4] These activities represent three points on a conventional isoquant. These activities are defined in such a way that the initiation of the hog enterprise at a certain level in 1956 implies that it will never be less than this level for the remainder of the period. A larger hog enterprise in years after 1956 may be possible, however. This is accomplished by the introduction of additional activities beginning in 1957 instead of 1956. The levels of the three hog activities started in 1956 are denoted as follows:

x_7 = number of hogs raised annually in 1956 through 1960 with high protein ration
x_8 = number of hogs raised annually in 1956 through 1960 with medium protein ration
x_9 = number of hogs raised annually in 1956 through 1960 with low protein ration

[3] For a discussion of selection of phospate fertilizer programs, see Earl R. Swanson, "Selecting Fertilizer Programs by Activity Analysis," 1955 Tennessee Valley Authority Symposium on Economics of Fertilizer Use.

[4] Earl O. Heady, *et al.*, "Productivity and Substitution Coefficients in Pork Output," *Journal of Farm Economics* 35:341-354, August 1953.

Two types of cattle feeding operations beginning in 1956 are considered. One is good-to-choice calves fed on pasture; the other is good-to-choice calves fed on drylot. Similar to the hog activities, we assume that the adoption of a program requiring a certain number of feeder cattle in 1956 implies that there be no less than this number for the remainder of the five-year period. The levels of the two cattle feeding activities starting in 1956 are denoted as follows:

x_{10} = number of good-to-choice calves annually fed on pasture in 1956 through 1960
x_{11} = number of good-to-choice calves annually fed in drylot in 1956 through 1960

In order to provide for the conversion of pasture and other resources into hay, a hay making activity is introduced.[5] This activity refers only to the year 1956.

x_{12} = tons of hay produced in 1956

It should be noted that no hay buying or selling is provided for in the model. This is not, of course, a limitation of the method of activity analysis.

The lack of a grain combine means that alternatives of purchasing a combine or of hiring a custom combine might be considered. Accordingly, the following activities are introduced:

x_{13} = acres of oats harvested by purchased six-foot combine during five-year period starting in 1956
x_{14} = acres of oats harvested by custom operator in 1956

The period of small grain harvest and haymaking may necessitate the addition of hired labor. Accordingly labor hired during this period (June 15-July 15) is provided in a labor hiring activity:

x_{15} = hours of labor hired during June 15-July 15, 1956

This model provides for both purchase and sale of grain. Thus we do not predetermine that only enough livestock will be fed to utilize the grain. The two activity levels are specified as:

x_{16} = bushels of corn equivalent sold in 1956
x_{17} = bushels of corn equivalent purchased in 1956

This completes the specification of activities for the year 1956. It will be recalled that some of the activities imply continuance for the entire five-year period. This is true for the cropping systems, the livestock activi-

[5] For a treatment of the timing of hay production through the season see Earl R. Swanson and Kirk Fox, "The Selection of Livestock Enterprises by Activity Analysis," *Journal of Farm Economics*, 36:78-86, February 1954.

ties, and the purchase of the combine. The other activities may be discontinued after 1956, if such discontinuance is more profitable.

We next designate activities which begin in 1957. Each of these activities is assumed to continue for the remainder of the five-year period ending in 1960. The hog and beef feeding activities are similar to those considered in 1956. They represent *additions* to any hog and cattle numbers that may appear in the 1956 plan. Thus we have:

x_{18} = number of additional hogs raised annually in 1957 through 1960 with high protein ration

x_{19} = number of additional hogs raised annually in 1957 through 1960 with medium protein ration

x_{20} = number of additional hogs raised annually in 1957 through 1960 with low protein ration

x_{21} = number of additional good-to-choice calves fed annually on pasture in 1957 through 1960

x_{22} = number of additional good-to-choice calves fed annually in drylot in 1957 through 1960

An activity for haymaking in 1957 through 1960 needs to be introduced to permit any expansion in the livestock program that occurs in 1957:

x_{23} = tons of hay produced in 1957 and each year thereafter through 1960

Since provision was made for postponement of the purchase of the combine in 1956, we now need to introduce again the alternatives of combine purchase and custom work:

x_{24} = acres of oats harvested by purchased six-foot combine during four-year period starting in 1957

x_{25} = acres of oats harvested by custom operator in 1957 and each year thereafter through 1960

The hiring of labor during small grain harvest and haymaking is also an activity for 1957 through 1960:

x_{26} = hours of labor hired during June 15-July 15, 1957 and each year thereafter through 1960

Grain selling and purchase may also need to be adjusted after the first year. Accordingly, activities are again introduced for purchase and sale of grain:

x_{27} = bushels of corn equivalent sold in 1957 and each year thereafter through 1960

x_{28} = bushels of corn equivalent purchased in 1957 and each year thereafter through 1960

Finally, an activity is added to transfer income from 1956 to the following year 1957:

x_{29} = dollars of income in 1956 above a specified level for fixed costs and household withdrawals

Other income transfer activities could be introduced at the expense of increased computational burden.

Restraints

In general, the restraints are inequations or equations that relate the resource utilization of the various activities to the quantities of resources available. Of special interest in the crop-livestock complex are those relationships that provide for the transfer of grain and forage from the cropping system to the livestock system.

The first restraints considered refer to capital available for cash expenses during 1956 and 1957. In order to simplify the discounting procedures discussed later, all expenses for a given year are assumed to be made on January 1 of that year. Income for a given year is assumed to be received on December 31. Since all cropping systems are in the initial stages of the phosphate "buildup" program, cash outlays for crops are high in the first year. Equipment for hogs as well as purchase of breeding stock also makes capital outlays high for hogs in the first year as compared to later years. A purchased combine would also cause a heavy drain on capital. Thus we see that the model needs to provide for one of the important relationships between livestock and crops: the competition for capital.

We may write the capital restraints for 1956 as follows:

(1) $\sum_j a_{1j}x_j \leqslant$ capital available for cash expenses on January 1, 1956

$j = 1, 2, 3, \ldots, 29$

The a_{1j} refer to the per unit capital requirements of each activity during 1956. Since we wish to restrict consideration of plans to that group in which the 1957 expenditures must be financed by a certain portion of the 1956 income, we write:

(2) $\sum_j a_{2j}x_j \leqslant 0$

where a_{2j} are the activity capital requirements for 1957, except for $a_{2,29}$ which is -0.5. This represents the proportion of income above the fixed costs and minimum household withdrawals that is available for spending in the farm business in 1957. The 1956 income equation

(3) $\sum_j a_{3j}x_j = 5{,}000$ dollars (minimum requirement for household and fixed costs)

represents the requirement of the plan to have at least 5,000 dollars income in 1956. This may be viewed as a requirement on the time shape of the income stream in addition to that of the customary discounting of future costs and returns at a fixed rate. In relation (3) the a_{3j} represent the unit incomes from each activity except for $a_{3.29}$ which is -1.0. This is the coefficient in the saving activity which acts to transfer 1956 income above 5,000 dollars to 1957.

Three relationships need to be specified to permit the flow of commodities produced in the cropping sector to the livestock sector. First a grain relation may be written for 1956

$$(4)\quad \sum_j a_{4j}x_j = 0$$

where the a_{4j} are the production coefficients in the case of the cropping systems, the consumption coefficients in the livestock activities and are -1.0 and 1.0 respectively for grain buying and selling. Thus the model dictates that grain will not be fed unless its opportunity cost is less than its marginal value productivity in feeding. Similarly, a pasture relation is specified for 1956. However, here we have an inequality,

$$(5)\quad \sum_j a_{5j}x_j \leqslant 2{,}000 \text{ pasture days (available from permanent pasture)}$$

where the a_{5j} represent the pasture production coefficients of each cropping system and the pasture consumption coefficients of the livestock. The hay requirement for pasture days is $a_{5.12}$. Thus pasture days may be transformed into hay, eaten directly by the livestock, or simply be produced in surplus.

A relation is needed to provide for the production and consumption of hay in 1956.

$$(6)\quad \sum_j a_{6j}x_j = 0$$

No provision is made in this particular model for the sale or purchase of hay. The desire to be rather self sufficient with respect to roughage is common in many areas of the Corn Belt.

One impetus for the inclusion of livestock on farms in the Corn Belt is the seasonality of the labor required for crops. Accordingly we specify the 1956 labor restraints for three peak labor periods: the spring farrowing season, small grain harvesting and haymaking, and corn harvesting.

$$(7)\quad \sum_j a_{7j}x_j \leqslant 480 \text{ hours} \qquad \text{March 15-April 15}$$

$$(8)\quad \sum_j a_{8j}x_j \leqslant 600 \text{ hours} \qquad \text{June 15-July 15}$$

$$(9)\quad \sum_j a_{9j}x_j \leqslant 480 \text{ hours} \qquad \text{October 15-November 15}$$

The 480 hours represent the two men available during the entire year and the 600 hours represent the total during the summer months due to the addition of a boy. An oats harvesting relationship for 1956 is represented as

$$(10)\quad \sum_j a_{10j}x_j = 0$$

where for each of the cropping systems the a_{10j} represent the fraction of a rotation acre in oats. For the harvesting activities x_{13} and x_{14} the a_{10j} are -1.0.

Several of the above restraints need to be restated to be made applicable to 1957 and the succeeding years through 1960. We will simply write these without further explanation.

(11)	$\sum_j a_{11j}x_j = 0$	grain—1957 through 1960
(12)	$\sum_j a_{12j}x_j \leqslant 2{,}000$ pasture days	pasture days—1957 through 1960
(13	$\sum_j a_{13j}x_j = 0$	hay—1957 through 1960
(14)	$\sum_j a_{14j}x_j \leqslant 480$ hours	March 15-April 15 labor—1957 through 1960
(15)	$\sum_j a_{15j}x_j \leqslant 600$ hours	June 15-July 15 labor—1957 through 1960
(16)	$\sum_j a_{16j}x_j \leqslant 480$ hours	October 15-November 15 labor—1957 through 1960
(17)	$\sum_j a_{17j}x_j = 0$	Oats harvesting—1957 through 1960

Finally, we consider the quantity of land available for cultivation and write this restraint as:

$$(18)\quad \sum_j a_{18j}x_j \leqslant 300 \text{ acres}$$

Criterion for Choice of Activity Levels

The alternative activities together with the set of relationships defining, in some sense, the relevant physical possibilities have been presented. The economic problem is one of choosing optimum activity levels. This is done by constructing a profit relation that is to be maximized subject to the 18 restraints discussed above. Since we assume that the relevant horizon for discounting is five years, we maximize the present value (P. V.) of the plan. The criterion relation is thus:

$$(19)\quad \text{P.V.} = \sum_j \sum_t \frac{x_{jt}p_{jt}}{(1+r)^t} \qquad \begin{matrix} t = 0, 1, 2, 3, 4, 5 \\ j = 1, 2, 3, \ldots, 29 \end{matrix}$$

where the p_{jt} represent the price of the j-th activity in t-th time period. Prices used in the computations were for the period 1948-52 with the

exception of cattle which were valued at 100 percent of parity for that period. A discount rate of five percent was employed.

Before presenting the results, it is well to emphasize again the analytical advantage that a model of this general nature may have over budgeting by the usual methods: all resources considered to be relevant in restricting profit as well as all enterprises listed as alternatives are considered systematically in a manner that insures the selection of the highest profit plan.

Results

Results for two different quantities of starting capital were calculated. Situation A represents starting capital of 12,000 dollars available on January 1, 1956; Situation B represents 15,000 dollars starting capital. The optimum activity levels were as follows:

Activity	Level	
	Situation A	*Situation B*
x_1 = corn-corn-oats (cl) 85 bushel corn 1956-60	285 acres	252 acres
x_4 = corn-corn-oats-clover 90 bushel corn 1956-60	15 acres	48 acres
x_8 = hogs, medium protein, 1956-60	170 hogs	271 hogs
x_{11} = drylot cattle, 1956-60	—	17 cattle
x_{12} = hay produced 1956	2 tons	16 tons
x_{14} = acres of oats custom harvested 1956	98 acres	95 acres
x_{15} = hired labor June 15-July 15, 1956	16 hours	85 hours
x_{16} = corn equivalent sold 1956	16,890 bushels	13,830 bushels
x_{19} = hogs medium protein 1957-60	101 hogs	—
x_{22} = drylot cattle 1957-60	28 cattle	44 cattle
x_{23} = hay produced 1957-60	24 tons	49 tons
x_{25} = acres of oats custom harvested 1957-60	98 acres	95 acres
x_{26} = hired labor June 15-July 15, 1957-60	137 hours	226 hours
x_{27} = corn equivalent sold 1957-60	13,580 bushels	11,390 bushels
x_{29} = 1956 gross income above 5,000 dollars	$27,870	$31,940

First let us examine the cropping systems selected. In both capital situations the high level nitrogen application was selected for each rotation. Two rotations were selected in each capital situation. The four-year rotation with stand-over legume appears in each program only to the extent necessary to furnish roughage for livestock during the period 1957-60. Since more capital was available for a livestock program under Situation B, more acres of cropland are devoted to roughage. This choice was made, however, on the basis of the last four years of the plan. An examination of unused pasture days in 1956 shows that about 1,600 pasture days were not utilized under both capital situations. However, in the period 1957-60 pasture is completely utilized.

The growth in livestock numbers in the second year of the plan is of interest. Only hogs appear in the 1956 program for the lower capital situation. Drylot cattle as well as hogs are present in the 1956 program for Situation B. In 1957 expansion occurs in hogs in the Situation A plan. Drylot cattle also enter the Situation A plan in 1957. The Situation B plan experiences growth only in the drylot cattle enterprise.

The rejection of purchasing a combine should be noted. Although the total discounted cost for harvesting by custom operator was higher than that for a purchased combine, the capital scarcity and competition from other enterprises in the two beginning years of the plan did not permit the purchase of a combine. It should be pointed out that, similar to conventional budgeting, account was not taken of the additional uncertainty added by dependence on a custom operator to harvest oats.

The utilization of resources explicitly considered was quite complete. Mention has already been made of the unused pasture days in 1956. The only other resource that was not fully employed was labor. In the March 15-April 15 period for 1956, 115 hours were not used in Situation A; seven hours were not used in Situation B. The additional capital in the latter case enabled more complete utilization of labor. The same pattern existed for the October 15-November 15, 1956; Situation A, 39 hours unused; Situation B, 21 hours unused. During the last four years all resources explicitly considered were fully utilized in both Situations A and B with the exception of labor in the period October 15-November 15. Only nine hours were left unused in Situation A and 18 hours in Situation B.

DISCUSSION: LINEAR PROGRAMMING AS A TOOL IN FARM MANAGEMENT ANALYSIS

JAMES S. PLAXICO
Oklahoma A. & M. College

Dr. McCorkle is to be congratulated on the concise manner in which he has isolated the issues relevant to the application of linear programming to farm management analysis. His paper effectively summarizes the characteristics and the recognized applications of linear programming to the field. Inasmuch as I find myself in substantial agreement with the ideas developed by McCorkle, I have elected to direct most of my remarks to related issues not explicitly treated in McCorkle's paper.

Following Dorfman, the basic assumptions and postulates of linear programming have been compared with and contrasted to the so-called marginal models. However, as McCorkle and others have indicated, marginal concepts are implicit in the programming method. Thus, the relevant comparison is between continuous and discontinuous or discrete models, for the logic of the maximizing-minimizing framework of linear programming is identical to that of the more conventional marginal models.

Too often the basic economic model and the statistical model or estimating technique are confused. This is decidedly the case in the literature dealing with linear programming. Given a problematic situation or a problem, the economic model specifies the set of admissible hypotheses and their underlying assumptions. Similarly the statistical model specifies the data and the admissible techniques to test the suggested hypotheses and to estimate the relevant coefficients. A given hypothesis may be tested and the parameters estimated by a statistical model or estimating technique involving either continuous or discrete functions. For example, an economic model would suggest that crop yields are, to some extent, an increasing function of fertilizer inputs and that diminishing marginal productivity prevails. Furthermore, rules of economic choice would indicate that with unlimited capital and related assumptions, fertilizer inputs could be profitably increased so long as the product-factor price ratio exceeds the factor-product production ratio.

The suggested hypothesis could be tested and the coefficients necessary to determine the economic optimum could be estimated by a variety of continuous and a similar array of discrete functions. Thus deciding, for example, to use an estimating technique involving a continuous function is no final solution because a vast array of continuous functions could be estimated. An estimating technique may be selected *a priori* on the basis of the relationship of the statistical model to the economic model or on the basis of expected convenience. Alternatively the coefficients of several statistical models could be estimated and a final selection made on the basis of economic or statistical tests.

In the case of most farm management problems, a tentative choice between continuous and discrete estimating functions can be made *a priori* on the basis of convenience of computation, expected accuracy of results and availability of data. The choice of functions may be made (1) where data relating to the problem are available, or (2) where data must be secured by experimentation or other means. In general where data are available in the desired form, simple relationships such as levels of fertilization or feeding can be more conveniently estimated by techniques involving continuous functions. This is true because there is apparently no biological reason to assume anything other than a continuous function, and optimum inputs under various price relationships can be easily ascertained. On the other hand, where the necessary data are not available, one must question whether or not the return in terms of additional information that may be obtained by the use of a continuous function is sufficient to justify the additional costs involved in assembling the data required to fit a continuous as compared with a discontinuous function.

More complicated whole farm functions involving the combination of different resources and practices to produce alternative products could also be estimated by techniques involving continuous functions. However, the mathematical and computational problems involved are formidable. Thus, continuous models are seldom utilized in these types of problems simply because the resources required to compute such functions can often be used more effectively elsewhere. Admittedly, some of the postulates of linear programming do not entirely agree with our present idea of the true relationships involved. However, relaxing or adding certain restrictions to our statistical and economic models often enables us to estimate complicated relationships by the relatively simple technique of linear programming.

Furthermore, as McCorkle indicates, if we consider a sufficient number of

activities, a continuous function involving interdependence and other desired characteristics can be very closely approximated. However, in determining the number of processes to consider we must compare the marginal value of the additional information which provides more precise estimates with the opportunity costs of the additional resources required.

Those who feel that the conventional marginal models are unsatisfactory because they do not adequately explain or predict entrepreneurial actions, find little solace or comfort in linear programming. It is true that programming was developed in the field of scientific management rather than in economics. Furthermore, linear programming was developed as a practical planning tool while the more conventional marginal analysis was originally developed to describe and to predict economic relationships and was later adopted as economic choice rules. Nevertheless, as has been indicated, the maximization-minimization choice rules of linear programming are virtually identical with those of the more conventional marginal models. The program method merely simplifies the determination of the optimum.

Linear programming can, of course, be used to describe and predict relationships in the same manner as conventional marginal models if decision making units do in fact seek to maximize profits and minimize costs in the manner postulated by marginal analysis. If research should reveal that managers seek to maximum or minimize some other goal there is reason to believe that programming techniques can be adopted to consider other objective, or perhaps subjective goals.

Much of the research in farm management has dealt with rather minute parts of the total farm-firm allocation problem. Yet, observation would suggest that the combination of enterprises and production practices into a farming system represents the type of management question that is of more importance to farmers. The lack of a reliable and convenient estimating technique, rather than a lack of interest on the part of researchers explains, to a large measure, this apparent misallocation of our research resources. The advent of linear programming, which substitutes the concept of the process for the production function concept of the more conventional techniques, provides the tool needed better to consider total farm-home and intraindustry interindustry allocation problems. Previously such questions could be approached by budgets and other methods, but linear programming is a more powerful tool because it is easier to apply, it is more objective, and it assures the optimum solution from among the possibilities considered.

As linear programming results are used by research and extension workers to suggest optimum individual farm resource allocations it is to be hoped that the aggregative effects of individual shifts are not ignored. Obviously, if any large group of farmers make similar adjustments the change will be reflected by shifts in factor-product prices. If the magnitude of the price ratio shifts is large the original optimum program may not in fact be optimum under the new conditions. Kowledge of aggregative relationships is sorely lacking, but it is not safe to ignore the dynamic nature of price ratios while the characteristics of such movements are being investigated. The possibility of shifts in technical ratios must also be considered.

Since for the firm, factor, demand and product supply curves are kinked (i.e., a series of linear segments) under the assumptions of linear programming, the crucial coefficients of the program could be determined and the results pre-

sented in terms of optimum combinations for given ranges of the crucial coefficients. As a further refinement the presentation should indicate the magnitude of the shift in optimum organization when the critical values fall outside the range of those resulting in the computed optimum program. Such a huristic method of testing the sensitivity of a program to price-technical ratio shifts is admittedly crude. However, data in this form would give managers and society a much better basis for decision making and choice.

I see no way by which production economists can continue to gracefully avoid directing attention to the factor and product markets facing farmers. It is true that important gaps in theory restrict such analyses. However, even crude estimates of the nature of individual and overall product supply and factor demand functions in agriculture could be of tremendous value in programming individual farms and in evaluating alternative policies. I believe that linear programming techniques have much to offer in this area. In fact, as we gain experience in the application of the method and the necessary theory and data become available, I am inclined to believe that the most important contribution of linear programming will be in the estimation of aggregative relationships. The pioneering input-output work of Leontief is closely related to linear programming and is an obvious example of one way that programming techniques can be utilized to estimate aggregative relationships. Similarly Peterson and Heady have utilized the Leontief "open" model to estimate certain interdependence coefficients among sectors of agriculture and among agriculture and other industries.

As McCorkle indicates a by-product of programming computations is the marginal products of the different resources in different programs. Such estimates have, of course, been made previously by fitting various functions to cross-sectional farm data. However, these estimates are considered by many to be suspect and generally unsatisfactory because of many questionable assumptions and techniques. The marginal value estimates of long term assets, derived from programming analyses, will be of particular interest.

In summary, it appears obvious that linear programming is no longer a novelty, but is taking a foremost place as a research technique in agricultural economics. Applications to date have been largely limited to problems of the firm with one or more limiting resources. However, it is anticipated that as we become experienced in its use the tool will find a much broader application. It would appear that the lack of meaningful hypotheses and the lack of suitable data are presently the major factors limiting its usefulness.

DISCUSSION: ACTIVITY ANALYSIS: AN AGRICULTURAL MARKETING TOOL

KIRK FOX
University of Illinois

The author of this paper, Dr. Charles French, has near completion applied research in activity analysis that is new and pathbreaking. Dairy marketing specialists for whom I have great respect report that this research should prove very useful, both for its practical empirical results in the immediate area of its application and as a model for subsequent work.

Without knowing as much as one should to form a sound opinion, I am a booster for any attempt to apply activity analysis to agricultural economics problems, including marketing. Nonetheless, like most discussants, I am critical of the paper it is my assigned duty to discuss. I hope to have read this paper from the point of view of most of its auditors and later its readers, especially those not initiated to activity analysis or at least its application to agricultural marketing.

This paper is in an increasingly popular class of what I would call "survey" papers. Some survey the past, others attempt to survey the future or both. Beyond being shown that the author knows what he is about and has seen most of the relevant literature (both of which were already known) one is usually left pretty "high and dry." (In Charlie's terminology this would be called "unwashed" or perhaps even "unrinsed.") Of course such papers do merit a star in the card file as providing very useful footnote bibliographies. But "survey" papers if they are properly broad and short enough to fit the allotted time are too full of hasty references to papers not seen or not remembered or of technical allusions that have slight value for the nonexpert.

Many of us are in marketing and have problems. When we read a title such as "Activity Analysis: An Agricultural Marketing Tool" we hope to see the tool in use on a simple enough model so that we may understand its mode of use and perhaps by analogy be stimulated to see its applicability for our own problems.

But this is only criticism of most "survey" papers and perhaps indicates what only one person would rather find in such expository type discussions.

In his first paragraph French says he will show the import of the assumptions of activity analysis for marketing problems. This he clearly and carefully does. But he also discusses the likely applicability of his list of assumptions to the broad class of marketing problems, and leaves the general impression that these assumptions are quite generally appropriate. There may be a serious question as to the value of discussing these assumptions with respect to so broad a class of problems. Marketing is indeed a production operation made up of many successive or alternative production processes. It seems reasonable to try a production analysis tool for many problems in this area. But the assumptions of the method are reasonably "good" or "bad" only vis-a-vis a particular problem situation, and perhaps cannot be given a *general* evaluation.

It may be useful to somewhat arbitrarily distinguish between two categories of problems that are appropriately attacked by agricultural marketing researchers. First, there are those problems that are related to marketing agencies and their functions with respect to those whom they serve. Let us call these external problems. Secondly, there are those problems that lie *within* individual plants or firms that are part of the total marketing structure. Let us call these internal problems. Of course each class of problems is dependent upon the other. But when we view internal problems we find situations that are hardly distinguishable from the internal production problem situations in any nonmarketing firm. The approaches to and methods for solution of such problems can be carried quite bodily from their successful applications in other production areas. Feed and fertilizer mix problems, dairy product-line mix problems, selection of processes, internal labor use, inventory and order scheduling problems all fall into this category. It is surely proper that these things should be studied by marketing people when the firms are part of the total marketing

complex. However, my last point is that the uses of activity analysis for problems that are marketing *qua* marketing, in a purer sense, are in a sad minority as indicated by French's bibliography. The only studies underway that deal with the category of external problems are the work of Judge on the movement of eggs from surplus to deficit areas, the proposed study by Judge and Plaxico on the optimal location of livestock marketing firms, and perhaps the school milk problem of Waugh. Since the method for solution of problems in this sector *cannot* be lifted from other areas, here it seems is the greatest opportunity for creative application of activity analysis by agricultural marketing researchers. The pressure for survival in our competitive economy may select those firms that have solved their internal problems well. But maximization for individual units is not necessarily maximization for the marketing industry as a whole or for the functioning of the mechanism relating the units and their decisions.

DISCUSSION: INTEGRATING CROP AND LIVESTOCK ACTIVITIES IN FARM MANAGEMENT ACTIVITY ANALYSIS

R. J. HILDRETH
Texas A. & M. College

At these meetings last year Plaxico, in a discussion of a paper by Heady, stated that "A consideration of the logic and power of linear programming leads one to conclude the mathematical development of the method has forged far ahead to the practical applications in farm management-production economics."[1] This very imaginative paper by Swanson has, in a large measure, illustrated that progress is being made in the practical use of this tool in farm management and production economics.

To me, the most intriguing aspect of Swanson's paper is the consideration of time. Optimum organization of a farm situation under static conditions is of interest and value, especially in setting up "benchmark" situations, but these solutions ignore some of the very real problems that farmers face. As the farm firm matures by reinvestment of capital and soil build-up, different optimum organizations are needed. This paper certainly should stimulate more analysis in the area of dynamics with the use of activity analysis.

We also should not overlook his imaginative techniques in integrating the cropping and livestock systems. Definition of a rotation as an activity enables him to bring in complementary relationships in the rotation. By consideration of various levels of fertilizer application as activities, he has reduced the fertilizer production function to linear sectors and thus approximated diminishing marginal returns. By considering three levels of protein in the hog activity, he has also removed the assumption of constant linear substitution rates and approximated a curvilinear isoquant or equal product curve.

Special mention also should be made of the use of an income transfer activity. This is another example of his imagination in setting a model that more nearly approximates reality by allowing reinvestment of capital.

I should now like to discuss and develop some of the points brought out by

[1] See *Journal of Farm Economics*, Vol. 36, No. 5, December 1954, p. 1050.

Swanson's paper. Defining a rotation as an activity is a neat way of handling the bothersome problem of complementarity. An assumption of activity analysis is independence of the activities, thus only competetive or supplementary relationships can be considered. However, this technique leads to odd results. We see in his final results that for situation (a) the farmer would have two rotations, 285 acres of corn-corn-oats (clover) and 15 acres of corn-corn-oats-clover, and for situation (b) 258 acres in the clover catch rotation and 48 acres in the clover rotation. It seems somewhat strange to recommend that a farmer with a homogeneous soil have two different rotations, especially with relatively small acreage in one rotation. In the particular case presented, if purchase of hay were allowed this situation may not have arisen. This may be the price we pay for being able to handle complementarity. This technique also raises the problem of allocating nitrogen fertilizer among the crops within the activity to insure equal marginal returns. Fertilizer carry-over creates problems in obtaining the coefficient for such an activity. In fact, most cropping decisions are already made once the coefficient is obtained.

When planning over time takes place some of the fixed resources become variable due to use and obsolescence. It may be necessary to include activities for the replacement of some of the fixed resources. Swanson has illustrated one method of handling the problem by including activities for oats harvesting by custom operator or owned combine.

Using this technique as a means of studying aspects of the dynamics of farm planning would be very interesting. For example, a plan could be obtained for a five-year period with a given level of price expectations. Then assume a shift in expectations and recompute the program but with some resources committed. It might be possible to follow and predict some of the changes in farm organization due to changes in expectations.

Swanson carefully defined the farm situation in setting up his model. This brings up a point in regard to the use of the results of activity analysis. Different farmers are faced with different situations, especially when time is considered and restrictions are put on the shape of the income stream. In order to put out plans that would aid individual farmers it may be necessary to compute many programs even when the same basic resources are available. Obtaining a "benchmark" situation considering time is more difficult than the static case considered. As activity analysis progresses it may be that the extension service or perhaps even private agencies may set up a programming service for farmers so that they can come to the agency, give them the situation and their desires and then have the program computed. This would certainly cause many changes in the extension program of most states.

In the solution presented by Swanson, labor was not fully utilized. However, labor often is limiting. In setting up the requirements for activity analysis the usual procedure is to follow the general timing of crop operations common in the area. In many areas and with many crops it may be possible to reschedule operations and thus better utilize this resource. Curry[2] has presented a relationship between plant development and temperature and has suggested the possibility of rescheduling farm operations from a knowledge of this relationship. He also gave an example illustrating the manner in which the operation of a farm could be rescheduled. Scheduling on a basis of climatic factors has been

[2] Curry, "Climate and Economic Life: A New Approach," *The Geographical Review*, Vol. 42, pp. 367-383 1952.

successful in vegetable production on the eastern seaboard. Here is a possibility of helping farmers to better use their resources. I realize there are many problems associated with the scheduling of cropping operations such as seasonal variation in moisture and temperature and the relationship of these variations to yield, but yet there appears to me to be a need to investigate the returns that could be obtained from a rescheduling of farm operations.

I would agree that one of the major problems in the use of activity analysis is the lack of adequate data. Much of the real "work" in performing activity analysis is in the collection of adequate data. Another problem mentioned is uncertainty. A method for programming with considerations of variations in input coefficients where the errors in the coefficients are random, small and normally distributed has been presented by Babbar, Tintner and Heady.[3] However, there is some question if the assumptions about the errors are accurate for many parts of the country, especially the Southwest.

An example of what can be done with activity analysis has been given by Swanson. It seems to me that his paper illustrates more useful and powerful techniques than have been developed previously in the field of activity analysis. Activity analysis is rapidly becoming a useful tool for inclusion in the tool kit of a research worker.

---

[3] Babbar, Tintner and Heady, "Programming with Consideration of Variations in Input Coefficients," *Journal of Farm Economics*, Vol. 37, May 1955, pp. 333-342.

POLITICAL ECONOMY RECONSIDERED

Chairman: L. J. Norton, University of Illinois

APPLYING WELFARE ECONOMICS TO FARM POLICY

O. H. Brownlee
University of Minnesota

THE general topic of this session is "Political Economy Reconsidered." When I first read it, I was immediately reminded of occasional articles in the *New Yorker* entitled "Cloudland Revisited" in which S. J. Perlman described his reactions upon reviewing or rereading, as a middle aged male, movies or novels that had excited him when he was an adolescent. His reaction was one of both disillusionment and boredom. *The Shiek* and *Daisy Miller* may have stimulated the imaginations of the unsophisticated child, but were paled by the experience of a run-of-the-mill adult male. A middle aged economist may suffer similar disillusionment and boredom in rereading selected parts of *The Wealth of Nations*, Ricardo or either of the Mills. What one took for "gospel" with respect to economic policy as a graduate student, turns out to be a weak armor for a practicing economist arguing about farm policy with a congressman from an agricultural area. Unfortunately, our "Corn Laws" will not be repealed as a result of quoting appropriate passages from the works of the early political economists. And our present day counterparts of Smith, Ricardo and the Mills usually refuse to pass judgment on changes that make farmers worse off even though such changes would make non-farmers better off.

The dogma termed political economy was an attempt to construct a complete ordering of various possible social states. It not only estimated what was possible; it also said that one possibility was as good as, better than, or worse than, another one. Thus, to one who had faith in the judgment of the person constructing such a welfare function, it provided a "cookbook" for economic policy. It appears that the classical "cookbooks" were of considerable influence in England and even in the U.S. during most of the nineteenth and early twentieth centuries. They supported relatively free international trade and the antitrust laws. They also provided a basis for largely ignoring farmers' and low paid wage earners' protests that their rates of compensation were too low and should be raised by governmental action. Perhaps these "cookbooks" were influential in limiting measures that were taken to improve the positions of farmers to such innocuous ones as easier farm credit.

The most extensive development of this kind of political economy was achieved by Pigou who restated the classical prescriptions for policy but

added some relating to the distribution of income. The doctrines of Pigou as well as those of the classical economists were of little significance to policy makers following World War I. Furthermore, the value aspects of classical political economy were not generally understood by economists until the early 1930's. The analysis of Lionel Robbins made it clear that some of the classical assertions (particularly some of Pigou's) regarding economic policy were based upon assumptions that were not empirically verifiable.

A reconstruction of Political Economy, now called the "New Welfare Economics" began to be widely considered with the appearance of papers by Hicks and Kaldor in the late 1930's, although a similar construction had been provided earlier by Pareto. Both Hicks and Kaldor held that any change that increased the utility of at least one person without decreasing that of any other person represented an increase in the welfare of the relevant set (providing that the utility of no person should be weighted negatively in a social welfare function). Kaldor followed Pareto in suggesting that if an economic change made it possible to increase the utility of at least one person without reducing that of any other, the change was desirable.

Some of the theorems of the "New Welfare Economics" that relate to resource allocation are similar to some of those of the old political economy. However, these theorems of the "New Welfare Economics" have been derived without the assumption that individual utilities are comparable—the assumption that discredited theorems of Political Economy. As has been indicated, two different ordering relations are employed by the "New Welfare Economics." One states that a social state is better than another one if it makes some persons better off and no person worse off. The other states that if a social state *could make* some people better off without making any other worse off, a change to such a state is desirable. Neither ordering relation permits a complete ordering of all possibilities. The second states that any Pareto optimal position, i.e. any position such that one can be made better off without making someone worse off, is better than any Pareto nonoptimal position, but refuses to compare Pareto optimal positions. The first is more restrictive in that it refuses to evaluate any change that would make some people worse off and some better off.

Pareto optimality as an objective of economic policy differs from the objective of much of the earlier political economy—i.e. maximizing national income for any given human population—largely in avoiding the problem of aggregation inherent in describing national income by a single number. Otherwise it has the same appeal, or lack of it, that is possessed by the objective of maximizing national income. One's initial

inclination is not to condemn a person for failing to support a Pareto optimal policy if it will make him worse off.

It has been argued that the alternative ordering relation imposing the requirement that a change make no one worse off, e.g. that compensation be paid to the losers, gives undue weight to the status quo. It may compensate people to stop practices that generally are considered to be socially harmful. Little[1] has attempted to construct an admissible set of noncomparable Pareto optimal points by requiring that the income distribution accompanying a change be "not too bad." This requirement is so ill defined, however, that it is useless for economic policy purposes. There may be as many satisfactory income distributions as there are persons in the economy, and no one of them can be rejected by resort to a higher valuation principle.

Lange[2] and Bergson[3] suggested that individuals could be assigned weights—obtainable from polls, for example—and a complete ordering of possible distribution of income would be obtainable. However, Arrow[4] has shown that a social welfare function of the Bergson or Lange variety cannot be constructed if individual preferences are sufficiently different, and, at the same time, certain "reasonable" restrictions on this function are imposed. More recent work by Hildreth as well as others has shown some implications of relaxing one or more of the Arrow conditions.

What, then, is the contribution to economic policy of any of the variants "The New Welfare Economics"—i.e. a welfare economics that permits only a partial ordering of various possible "social states"? It does not provide us with a cookbook that lets us always say whether or not any possibility is as good as, better than, or worse than, any other possibility. Consequently, we cannot settle all policy problems by resorting to it. However, a complete ordering that resolves all policy problems and is universally accepted probably cannot be found. It is my contention that any contribution of welfare economics to the resolution of economic policy problems consists of the clear separation of facts (the catalogue of what is possible) and values (what is desirable). It can tell us what we should be debating rather than what the outcomes of most debates should be.

It might be contended that knowing what to argue about distinguishes those persons who possess "common sense" from those who do not. If this contention is accepted, current welfare economics may be considered

---

[1] I. M. D. Little, *Welfare Economics.*

[2] Oskar Lange, "The Foundations of Welfare Economics," *Econometrica,* 10:215-28.

[3] Abram Bergson (Burk), "A Reformulation of Certain Aspects of Welfare Economics," *Quarterly Journal of Economics,* 52:310-34.

[4] Kenneth J. Arrow, *Social Choice and Individual Values.*

largely as training in "common sense." It underlines the economy in political economy; for, it stresses how to reach most effectively an objective, even though it refuses to rank all possible objectives.

Applications by agricultural economists of "The New Welfare Economies" to problems of agricultural economics have not been rare. T. W. Schultz and Gale Johnson have appraised possible measures to achieve a given farm income in terms of the impacts of these measures on nonfarm income. In effect they have stated, "Let us not debate how large farm income shall be. Instead let us consider a given level of farm income such as would be achieved by a particular measure supported by Congress and appraise this measure according to how it, in comparison with others that will achieve an identical farm income, will affect nonfarm income." Comparability among possible policies is achieved by making the level of farm income the same in each case. A complete ordering is obtained by ranking each proposal according to the resulting nonfarm income.

Although the most frequent applications to agricultural economic problems have been to national agricultural price and production policies, problems in marketing and nonagricultural policies affecting farmers lend themselves equally well (or equally badly) to welfare economics analysis. Just as it can be demonstrated that the Brannan plan is superior (in the sense that every person's income can be at least as large as before) to government purchase and sale of farm products at prices above those at which the market will clear, so it can also be demonstrated that New York milk consumers and Wisconsin milk producers could afford to make payments to producers in the New York milk shed high enough to maintain the current incomes of these producers and still be better off—if Wisconsin milk were permitted to enter freely into the New York market at prices at which the market would clear. Similarly it can be shown that farmers and consumers could afford to compensate certain industrial laborers if restrictions to the free flow of labor off farms and into industry were removed.

My belief is that "The New Welfare Economics" has had little, if any, influence on public policy. Because it refuses to pass judgment on the distribution of income, Pareto optimality does not present a universal appeal to economists nor a widely accepted one to politicians. And compensation paid in a way such that the outcome would be Pareto optimal frequently is not acceptible to those who can block an economic change that is ranked as highly desirable by "The New Welfare Economics."

In my opinion—a belief supported by the work of Arrow[4] as well as that of some statisticians attempting to find a decision relation subject to properties similar to Arrow's "reasonable" conditions—that the search for an ordering relation that has universal appeal and at the same time will

be useful for policy purposes is a fruitless one. I believe that policy proposals of the kind that call for actual payment of compensation have been too short sighted, i.e. they have concentrated on an immediate prospect of making the situation slightly better and have lost sight of the larger job of providing an opportunity for real gains. Pointing out the consequences of extending to the rest of the groups in the economy the same treatment that has been provided to farmers through price supports and related controls may be much more effective in inducing farm representatives to abandon supports than indicating that farmers could be assured the same income as they now receive and other people could be made better off if the Brannan plan replaced the present program.

What I am arguing is that there is merit in Pareto optimality as a basis for evaluating economic policy. The politicians can argue about how the loot ought to be split; economists can indicate the losses that would be imposed upon the economy if a Pareto nonoptimal policy is chosen when a Pareto optimal one is available.

Following such a criterion would require that individuals take a chance on the distribution of income. However, no more favorable game could be offered to any one without making someone else's game less favorable.

If technological advance and shifts in consumer behavior are randomly distributed throughout the economy and if artificial barriers to the movement of resources were to be eliminated, every individual would have essentially the same chance to gain from following Pareto optimality as a policy criterion. The expected value of any individual's gain could not be made larger, without reducing the expected value of some other individual's gain.

My conclusions are like those of many sympathetic critics of welfare economics—"we could do a lot with it if people would only accept what we do" meaning if they would only accept the ordering relation that some of us have been trying to sell. If Pareto optimality is not accepted, we probably will continue to make policy statements on about the same basis as we have in the past; we will continue to encounter the same lack of enthusiasm from such statements and we will continue to consider the whole thing as an interesting game.

POLICY FORMULATION AND ECONOMIC LITERACY

EARL L. BUTZ
Assistant Secretary of Agriculture

ONE of the most critical factors limiting sound agricultural policy formulation in the United States is the relatively low level of economic understanding among the electorate.

In recent years governmental programs have been closely entwined with decision making of the individual farmer and with price and profit prospects for the agricultural industry, in the short run at least. This provides a fertile climate for the development of both individual and group pressures favoring particular programs or policies presumed to be in the short term interest of the sponsoring group. Proposals of this nature often have strong appeal to individuals who lack sufficient economic understanding to appreciate the full ultimate impact of the cause they sponsor upon themselves and upon the economy generally.

It is impossible for either the Congress or the Administration to move in the policy field very far ahead of the desires of the people. Members of Congress sometimes vote against their better judgment simply because they feel they cannot withstand pressures from back home for or against a particular policy. Administrative decisions in the executive branch of the government frequently are tempered by pressures that arise either through organized commodity groups or through political channels. In both cases sounder policy formulation and execution would result if a greater number of people had a better bag of economic tools with which to work.

Government is the biggest business in America today. Federal government expenditures are running approximately $64 billion annually. State and local government expenditures add another $28 to $30 billion. This means that this year we will spend just under $100 billion for government. Our gross national product in 1955 will run around $380 billion. This means that we now socialize approximately one-fourth of our gross national product; that is all of us together decide how each of us will spend one-fourth of his income.

Truly government is big business!

Need for Economic Education

A heavy responsibility rests on professional agricultural economists to promote a broad understandiing of the basic issues involving the relationship between agriculture and government. Never before in our history was the need greater for competent and objective agricultural economists. This responsibility for promoting broadened public understanding must be assumed by all agricultural economists, whether in our colleges,

with business and financial institutions, in trade association work, or in whatever walk of life they may find themselves.

The job before us is far broader than can be accomplished by the "professor in his classroom." The big job is one of adult education. This is a job that will never be finished. Indeed, as the relationship between government and agriculture becomes more and more complex, the tempo of activities must be stepped up in the whole field of adult economic education.

The role of government in business and agriculture has increased tremendously in the last two decades. This trend may slow down temporarily, but it will not be reversed. We live in the age of the "welfare state." Whether we like it or not is beside the point. If I were to use a single word to characterize the 20th Century, I think it would be "security." All about us we see a universal quest for security. We see it among individuals, among business organizations, among farm and labor organizations, among states, and among nations. We have seen rise in our generation the new philosophy of a permanent direct subsidy for agricultural producers. We have seen the development of a still newer philosophy of a permanent subsidy for consumers in the form of cheap food.

This means that it is now doubly important for all of our people to have a pretty basic understanding of the function of government in our kind of economy. It is important that they understand such things as supply, demand, and price relationships. These are fairly simple, elementary concepts. So often agricultural economists overlook their importance, as they push their teaching and their writing toward the frontier of more complex intellectual concepts. We must never overlook the always recurring need for elementary economic education among the masses of our people. To pursue this activity may not be so stimulating personally to the professional agricultural economist, but it may be more rewarding in terms of sound public policy.

If we believe there is merit in relatively free economic institutions in our society, it is important that the electorate understand the advantages and disadvantages of such a system.

If we believe that governmental policies should be pursued that place some restraint on endless attempts to reach into the United States Treasury for assistance to this group or that, then it is important that millions of people undersand more fully the relationship between their government and their own personal well-being. It will not be easy to accomplish this.

Your Task Is a Difficult One

Economics is a very difficult science. Many people have an innate prejudice against economics and against economists. Indeed, the science

of economics, and the whole area of social science for that matter, are relative newcomers among the various scientific disciplines. This is particularly true when they are contrasted with the physical sciences and the life sciences.

Like all young disciplines, agricultural economics is still in the developmental stage. We even argue among ourselves over such elementary things as terminology. This lack of standardized terminology, just to get specific, makes communication of ideas difficult even among members of our own profession. This is much truer in the social sciences than in the physical sciences. Small wonder, then, that the lay public frequently looks askance at our work and casts a critical eye at our recommendations.

Many adults now engaged in agricultural, professional, or political life in America had the unfortunate experience of being "poisoned" against economics as a science in high school or college. Many of them, recalling the drab discussions in their economics classroom, will always be convinced that economics is "the dismal science." This is unfortunate. Entirely too many beginning economics classes in high school or college are assigned to inexperienced instructors who succeed somehow in rather completely isolating the subject matter of the class from the realities of the day and from the personal experiences of the student. Think back on your own first class in elementary economics. If you still remember it as an inspiring experience, you are probably the exception.

There is another reason why the job of the social scientist is more difficult than that of the physical scientist or the life scientist. Social science deals with human beings, with all their prejudices, ignorances and half-truths. It deals with the relationship of men with men, of men with government, and of government with government. The area of its application changes so rapidly that answers good today may not apply tomorrow. Large groups of people resist social and economic change. They turn to government in an effort to preserve the status quo.

Those who keep up with the physical sciences usually take pride in the newest and most modern gadget or technique. We are all disturbed if the M.D. is "behind the times." But in social and economic matters, large groups of us adhere to beliefs that were current when diseases were treated by boring holes in the head or by letting blood. Someone has said "the only place where we prize antiques more than in our living rooms is under our hats." This is especially true with respect to social and economic adjustment.

Still another reason why the role of the social scientist is difficult is that everyone, in his own mind, qualifies as a social scientist. The man in the street is perfectly content to recognize the physicist as an authority in his own subject, the chemist as qualified in his own field, the biologist as

competent in his own area. The same individual is often reluctant to accord the same professional status to the trained agricultural economist. He may feel he knows more about economic and social questions than does the trained social scientist himself. At least he may feel his own solution to the problem is superior. This public attitude imposes a professional burden on the agricultural economist not faced by scientists in other disciplines.

Social Sciences Must Advance

It is within the capacity of modern science and technology to solve the age-old problems of hunger and pestilence in the Western World. But modern man has not yet learned how to manage his society and cooperate with each other in order to accomplish the high level of production and prosperity of which we are capable.

To create and preserve a political and economic environment in which potential living standard increases can occur is a major challenge facing government.

The science of political economy is lagging the physical and biological sciences. Our most pressing problem now is to learn how to live with and how to enjoy the age of science and technology which we have created for ourselves.

Important governmental decisions affecting agricultural policy are today more economic, political, and sociological than they are technological. When the Department of Agriculture was created in 1862, its primary function was to increase agricultural production, to encourage efficiency, and to perform certain regulatory duties. Its emphasis was "to make two blades of grass grow where one grew before." It set out to do this primarily through research and education. It did a magnificent job in this respect. The general philosophy was to aid the agricultural industry through the indirect media of research and education.

In the 1920's, the general philosophy undergirding agricultural assistance shifted to direct aid to the agricultural industry through cooperative marketing, agricultural credit, tariff adjustments, and the like. Emphasis was shifting from the technological to the economic.

In the 1930's, we developed a whole new philosophy affecting the relationship between government and agriculture. We inaugurated a broad program of direct financial assistance to the individual farmer. That program continues today. It takes the form of ACP payments, price support loans, crop insurance, soil conservation assistance, watershed and irrigation projects, and the like. As a result, there has developed a new relationship between the individual farmer and his government. The interest of the individual farmer is often in conflict with the group interest. The individual farmer often tends to view governmental programs in the light of

their potential impact upon his pocketbook. This view is nearly always from a short term vantage point. But it does mean that the really important agricultural policy decisions now made by government have substantial economic, political, or social overtones. This again emphasizes the urgent need for a higher level of economic literacy among our people if we expect to make progress in agricultural policy.

Different Viewpoints Must Be Compromised

Compromise is the very essence of democratic government. Our system provides for rule by the majority, with adequate safeguards for the opinions and rights of the minority. There is also frequently compromise within the Administration. Differences among various departments of the government must be resolved; the White House and one or more departments of the Executive frequently do not see eye to eye; differences between the executive branch and the Congress must be settled; compromises must be arranged among pressure groups, both within and without agriculture. But out of the whole process of give and take comes governmental decisions which, historically speaking, appear to be pretty good.

If we can assume among our policy-making personnel a desire to make economically sound decisions, the ideal procedure appears to be to push economic soundness as far as political expediency will permit. To know this exact point requires a finesse that few people possess. Yet find it we must. In the meantime, all agricultural economists must pursue a vigorous educational and informational program among the people and the politicians so as to move political expediency and economic soundness ever closer together.

Lloyd George, World War I Prime Minister of Great Britain, once remarked that the first duty of every statesman is to get himself re-elected. Otherwise, he can't be a statesman.

It is thus apparent that no governmental leader, however sound, can move very far ahead of the economic understanding and desires of his electorate. Otherwise, his influence will be reduced to zero at the next election. Political expediency is just as simple and just as practical as that.

The governmental decision making process at the policy level is often a problem of resolving conflicting pressures—pressures exerted on the Office of the Secretary by equally good friends of the Administration. This situation arises in those frequent instances in which there is no "correct" answer. Yet some answer must be reached. The common tendency in such cases is to search for the "least indefensible" answer. This is the solution which can be most easily "lived with" among those affected by it.

In this environment, policy formulation frequently evolves into a maze

of inconsistency. This is true because of the divergence of geographical interests, vocational interests, economic class interests, and a conflict of individual, industry, and public interest. A few cases will illustrate the point. The price support program we have been following is frequently inconsistent with our determined efforts to expand foreign trade in farm products. It is difficult for some people to reconcile our crop curtailment programs with expanded emphasis on research and extension. We strive on the one hand for increased efficiency in production and marketing, while on the other hand we engage in various legislative maneuvers to preserve operating units so small as to defy efficient production. We have acreage restriction programs in one part of the country while in other areas we spend millions of dollars on reclamation projects which will bring new acres into cultivation. Inconsistencies like these arise because of our failure to approach policy formulation as an entity rather than as a series of "unrelated" parts.

Local Pressures May Become Political

Pressures in support of economically unsound policies and programs often arise from local people and local areas in response to a particular commodity or area problem. These irritations soon find expression through members of Congress and local politicians, who sometimes discover they can engender sympathy among the people back home by further discussion of the particular irritation. This discussion in turn causes further agitation among the people affected, who then write their congressman in growing numbers, and the vicious cycle is started. The whole thing snowballs until the force is irresistible.

I recall some years back speaking with a congressman who had just voted for a price support measure that obviously was not in the best longtime interest of his constituents. Yet the measure had a short-term political appeal. He told me, "I was opposed to that act and tried to keep it bottled up in committee, but when it came to the floor of the House and we had a record vote, I had no choice but to support it." In his case a little more economic literacy among the people back home would have permitted him to be the kind of congressman he genuinely desired to be. Yet many people criticized him for the vote he cast. They should have criticized those of us responsible for the economic education of his contituency.

Unsound legislative proposals are often pushed for purely political reasons. In the last session of Congress, for example, the proposed $20 per person income tax reduction was an illustration. It took courage for a congressman or a senator to stand up against that, when in his heart he knew this was no time for that kind of budget irresponsibility. The at-

tempt in the last session of Congress to extend for three more years the system of high rigid farm price supports on basic commodities that got us into our current almost incredible surplus situation, is another illustration of an effort to seek a political solution to what is essentially an economic problem. A high level of economic literacy among our people will discourage moves of this kind.

Good Government Is Your Business

The science of good government is the business of all of us. The future of agriculture will continue to be closely entwined with government.

Time was when the federal government financed agricultural research and education, performed certain regulatory tasks for agriculture, and about stopped there. Today government extends its strong arm into every nook and cranny of agricultural production and marketing. Decisions made in Washington affect for better or for worse the economic opportunities and the happiness of farmers, food processors and distributors, and of agricultural scientists.

No longer can agricultural scientists and agricultural leaders withdraw behind the curtain of a technical education and ignore the impact of government.

To be a technical leader in agricultural science in the decade ahead will not be sufficient. Our agricultural scientists must also be political leaders.

The importance of good economic education at the grassroots of America can never be overestimated. This will influence present legislation, as well as the economic thinking of our leaders a generation hence.

About one-fourth of our gross national product now goes to government. It is your personal obligation to make sure that tremendous sum is wisely expended.

This is a job that can be accomplished only through a stepped-up program of economic education for tens of millions of Americans.

The professional agricultural economist is in a key spot to do this educational job well.

Sound public policy formulation thrives only in the fertile soil of rising economic literacy among all our people.

You must personally accept the challenge to keep government the servant of agriculture—not its master.

EVALUATION OF EXTENSION METHODS EMPLOYED IN FARM AND HOME DEVELOPMENT

Chairman: James E. Crosby, Jr., Extension Service, USDA

EVALUATION OF EXTENSION METHODS USED IN FARM AND HOME DEVELOPMENT IN THE MIDWEST

N. S. Hadley
Extension Economist, Purdue University

Introduction

NEARLY a century ago, this nation accepted the philosophy of using public funds for agricultural research. For more than fifty years, public funds have been used to teach technology to farmers. The combined efforts of research and education have resulted in a technical revolution in agriculture.

The business of farming has become big, complex, and highly efficient. Compared with a generation ago, the average farmer—in the Corn Belt—now operates about 50 percent more land, has three to four times as much capital invested and produces about twice as much.

There are few jobs on the farm that are done in the way they were done 40, 20, or even 10 years ago. Each new change has made it possible for one farmer to handle more acres of land or more livestock or get higher yields or higher livestock production.

These changes have not been an unmixed blessing to all farmers. They have made it necessary for him to invest more money, recombine his productive resources, and change his system of farming. They have made it necessary for him to have a different kind of knowledge and develop different skills.

Some farmers have been able to make the necessary changes—increasing their incomes and standards of living through reading, attending meetings, and observing demonstrations. But many farmers have not been able to make the adjustment because they find themselves lacking in understanding of business principles and managerial skill. Their competitive position in the business of farming has been weakened.

The farmer's problem is no longer a lack of knowledge in the physical sciences, but rather how to select and combine the enterprises and practices that best fit his situation.

It is only logical that public funds should be used to teach farmers to understand and apply management just as they have been used to teach technology.

The farm and home development work was designed to meet this need.

Congress is appropriating more than twelve million dollars annually to be used for the purpose of conducting this work.

The challenge of extension service is to use these funds in the most effective fashion.

What Are the Objectives?

The following is a definition of objectives of farm and home development work, prepared by The North Central Regional Farm Management Committee:

A. To make possible more effective and efficient use of public and private resources in agriculture and thereby insure a more adequate, dependable, and economic source of agricultural products for society.

B. To assist individual farm families by making an over-all approach to their problems by bringing the farm family information and assistance; . . .

They go on to spell out the kind of information to be presented and the assistance to be given in its application.

My assignment is *to evaluate extension methods used in farm and home development work.*

There are many phases of this work. They involve nearly all extension activities. They involve the farm, the farm home, the farmer and the farm family. They involve the entire field of agricultural technology. They involve the economic, social, religious and cultural values of the farm people.

However, I assume that my assignment is limited, primarily, to the farm management phase of farm and home development work.

Since this work is quite new, no comprehensive, scientific evaluation has been made. Therefore, I have elected to compare the advantages and disadvantages of some of the methods by which the major functions of extension teaching can be performed.

Bringing about changes in knowledge, understanding, skills, values, and attitudes is generally accepted as the purpose of education. I think I need not discuss this further except to point out that the most effective method for performing these functions is not always the same in extension work as it is in the formal class room. Nor is it the same for extension teaching of economics as it is of the physical sciences.

Most extension economists have had experience or training in one or more of the following areas: as classroom teacher, as research workers, or as extension workers in some physical science. Unfortunately, the methods best adapted to these tasks are not all transferable to extension teaching of economics. Herein is much of our problem.

In our meeting a year ago at Penn State, C. B. Ratchford stated:

> Since Extension does not have a captive audience, the principles cannot be taught in the same manner as they can in a class room. Decision making units

are interested in solving problems. Hence, principles should be taught in connection with recognized problems. Also, the extension economist should not feel that it is necessary to label a certain piece of information as theory or principle. The important point is for the decision making unit to have a working knowledge of the theory.

Functions of Extension Teaching

The teaching job of the extension economist involves the performance of certain functions—which I have classified as follows:

1. To capture interest.
2. To teach facts and concepts.
3. To teach people to understand, use, and habitually follow a logical decision making process.
4. To give them practice in the use of these new tools (knowledge, understanding, and system of decision making).

I would like to discuss the performance of each of these functions.

The first function is to capture interest

Extension Service is expert in this area—I believe I need spend very little time on it. But, it is well to remember that the job of capturing interest is not all accomplished at one time. Initial interest is gained by offering saisfaction to a felt need or the solution of a recognized problem. The solution of the first problem almost surely involves other problems. The solution of these problems involves still others, and this process goes on until the entire farm and the entire family is involved. Thus, we become engaged in the unit approach to the farm family's problems.

The second function is teaching facts and concepts

I would like to limit my discussion of teaching facts and concepts to three questions.

The first question is shall we teach by dogma or by reasoning?

When we teach by dogma, we give people *our* answers to *their* problems. We write recipes. This method has several advantages. We all use it at least part of the time. It is fast, it is simple, it is direct. Many people like it because it gives them an answer without much effort on their part. The results of this type of teaching are more easily identified and measured. It is used quite extensively in areas where the problems of individuals are quite similar and with many technical subjects where there is only one answer.

Dogmatic teaching has a number of disadvantages:

1. The teacher must be omnipotent in his wisdom—he must bear the full responsibility for the decisions.

2. It is difficult, if not impossible, to take into account the values of the participant.
3. It does not allow the participant to choose between other possible alternatives. It does little to widen his horizon of vision.
4. If conditions change, the answers are likely to be wrong.
5. The participant is not likely to learn principles which can be applied in other circumstances.

Teaching by reasoning

When we teach by reasoning, we teach and apply principles, we explain why the situation is as it is, we differentiate between cause and effect, we compare various courses of action and their resultant consequences.

This method of teaching has certain, very definite advantages:

1. The participants learn to know, understand, and apply certain basic principles and concepts. These principles are more likely to be transferable to other circumstances.
2. Values of the individual can be taken into account.
3. The learner is able to make a wider range of decisions for himself.
4. The burden of decision making rests on the learner.

When we use the reasoning process as a method of teaching, we are applying the old extension axiom: "It is not what we do *for* people—but what we do *to* them that counts!"

Discussion-type group meetings, using well prepared lesson outlines, supplemented by visual aids (such as blackboards, easel boards, charts, etc.) are ideal for teaching by the reasoning process.

The second question is do we speak the farmer's language or teach him ours?

Economic concepts and principles can be taught by abstract reasoning or by concrete application.

When using concrete examples, it is not necessary to teach economic terminology. The principle can be applied to real, practical circumstances within the experience of the learner. The learner can "discover" the principle for himself. This is a very satisfying experience for the learner. It stimulates his interest in economics. It is understandable to people who are accustomed to thinking in concrete terms. It leads from the known to the unknown. It encourages the learner to make wider excursions into the field of economics.

Teaching economic terminology has many well recognized advantages and can be the next step whenever the learner is sufficiently interested and enough teaching resources are available.

However, a farmer can use economic concepts without knowing their name, just as well as he can use 2-4-D without knowing its chemical formula.

Geometry or arithmetic: economic concepts can be expressed in geometry or in arithmetic.

Geometry and algebra may be useful tools for the researcher to use in working out economic relationships and for visualizing economic concepts. They are tools with which thoughts can be expressed rapidly and concisely between minds that understand these forms of expression. These economic concepts could also be expressed in Latin, in Greek, or in Chinese and would be equally understandable for people who do not know these languages.

Economic concepts can also be expressed in arithmetic. Arithmetic is the universal language. This is the language that farmers understand. The use of arithmetic in extension teaching is an absolute necessity. If research is reported in geometric terms, someone has to make the translation.

The third question is what are we to teach?

In some states, they are doing an excellent job of teaching improved technology. This approach has the advantage of being easy to initiate because the entire extension staff can be put to work on it. It also has the advantage that it no doubt helps to increase the incomes of the participating farm families. A third advantage is that the results are rather tangible, easily observed and measured. But it has the limitations of not helping the farm family to foresee the adjustments in their business that the new technology itself may force. Neither does it help them to see alternative uses for their labor and capital that might be more advantageous than the present system under which they operate.

In other states, the farm and home development program is pointed largely in the direction of increasing volume of business. These programs are most often found in areas where land and capital resources are quite limited—where labor is the most abundant resource and much of it is either unused or ineffectively used. Where this situation exists, there are at least four major alternatives available. These are:

1. To acquire more capital to balance labor resources (usually through borrowing).
2. To use available capital more effectively.
3. To get off-farm employment.
4. To be satisfied with low income.

But, in many states, only the alternative of increasing volume of business is given emphasis. Usually, this is a satisfactory solution to only a part of the people. Why not encourage participants to consider all of these choices?

In much of the Corn Belt, and other high capital areas, the situation is

quite different. Here the farms are larger, the land is better, and capital is more abundant. On many of the farms in these areas, the resources are all being used—but not necessarily most effectively. I believe most of the states in the Corn Belt have adopted the alternative use of resources as the approach to farm and home development work. This approach has a number of advantages. It allows the farmer and his family to appraise, for themselves, what system of farming suits them best. It allows them to compare the potential earnings of their business with earnings they might make at other jobs or in other business or on other farms. One of the real merits of this approach is that it never allows the boundaries of the farm to mark the limits of opportunity for the farm family. Also, it allows the farm family to constantly change their plans to fit their changing goals and opportunities.

To be able to compare alternatives associated with the business of farming, the learner must know and understand certain facts and concepts. For example:

He needs to know what quantities of labor and capital are necessary (with various degrees of efficiency) to achieve various levels of income. This will let him compare his earning opportunities on his farm with other farms and other jobs.

He needs to know input, output data for various crops adapted to his farm. From these he learns about competitive advantage and disadvantage—why Corn is King in the Corn Belt.

He needs to know the relative profitableness of various cropping systems (rotations). Here he learns about complementary and competitive relationships.

He needs to understand the principle of time, form, and place utility so that he understands *why* livestock feed nutrients are worth more in the form of grain than in the form of roughage.

He needs to know the economic characteristics of various livestock classes, where each class fits, and how enterprise selection can be used to balance the use of available labor and capital.

He needs to know how inputs and outputs are influenced by efficiency and size of enterprise—to understand the importance and interrelationship of size and efficiency.

He must be informed in the details of farm operation. No general plan is better than the details of operation that support it. When a farmer begins to develop the details of his operation, he is faced with many problems.

To help the farmer find the solution to some of these problems, we need to encourage him to take full advantage of outlook information. We need to give him guidance in finance, in working with people, improving his farm lease, improving his handling of hired labor, and in the realm of applied technology on the farm.

To teach the economic impact of new technologies, we need special lesson outlines, dealing with enterprise organizations and with certain functional operations. In the development of these lesson outlines, we

should cooperate very closely with the specialist from the technical subject matter departments.

Since these lessons are prepared for special interest groups, they probably should not be given specifically to those enrolled in the farm and home development program, but rather should be scheduled as regular extension meetings and all persons interested in this specialty invited to attend.

The third major function of extension teaching of farm management is systematic decision making.

In many states a separate form is provided for each step of the work. There is a special form for the inventory of farm resources; another form to list the needs of the family; still another for recording the soil tests, and still more for feed records, financial records, etc. All of these—more or less unrelated—factual records, are no doubt valuable and even necessary. But unless some orderly process is provided for integrating them into a decision making process, they may be more apt to confuse than enlighten. Participants may bog down in paper work—they may get lost in the trees and never see the woods.

In a number of states, simple, short work sheets have been prepared. These work sheets, along with pertinent data, can be used to analyze various courses of action and their resultant consequences.

The North-Central Regional Farm Management Committee has developed a rapid budgeting technique that uses prebudgeted blocks of input, output data. Several states are using this system.

A few hours of training and practice is usually sufficient to teach most farmers the use of this system. With this system, a farmer learns a logical, orderly decision making process. He learns to consider his present and potential alternatives and their consequences. He can quickly calculate the necessary capital and labor in-put requirements for several systems of farming and the returns he can expect from each. Not only can he compare various systems of farming from his farm, but he can compare these earnings with income he might get from other employment or from the operation of a different farm.

In a few states, they are trying out the use of linear programing. This approach has the very great advantage of giving a precise answer to the question of the most profitable resource combination. But it has the following serious disadvantages:

1. It is too complicated for the farmer to do for himself. It must be done for him. The answer is not his answer. Therefore, if circumstances change, he cannot arrive at a new answer.
2. With the use of this approach, it is difficult, if not impossible, to take into account the values of the farmer and his family.

The fourth function of extension teaching of farm management is to give the participant practice in the use of the new tools.

In addition to the work done through extension meetings, publications, and mass media, it is important to give the individual cooperator a considerable amount of special help in the use of the budgeting system, comparing alternatives, selecting the major enterprise, developing the farm organization, and selecting the production and marketing practices which fit his operations; to help him interpret outlook information, select suitable credit, and develop sound tenure arrangement. This work serves a two-fold function. First of all, it gives the individual farmer assistance in selecting from the wide variety of organizations and methods. Secondly, it gives the extension worker an opportunity to keep in close touch with developments in the farming business so that he becomes a better teacher.

Training the county extension personnel to perform this function is a prime responsibility of the farm management specialist.

Summary

In summarizing my remarks, I would like to give my judgement of the methods I have discussed, and include a few statements which, for reasons of brevity, have been omitted from the body of the paper.

1. Interest can best be captured and sustained by helping to solve recognized problems.
2. In teaching economic facts and relationships, the reasoning approach is most effective. Teach *why*—rather than *what*. Teach one principle at a time and then show their interrelationship. Provide the learners with "yard sticks" with which they can measure their resources. Provide them with standards with which they can appraise their opportunities. The discussion group provides an ideal situation of this type of teaching.

   This process can be done more quickly and be made more palatable if we use the farmer's language before teaching him ours.

   We can teach farmers economic principles and concepts without using formal economic terminology.

   We can develop economic relationships with arithmetic as well as with geometry and algebra.
3. We should supply the learner with a simple budgeting system with which he can quickly and easily compare alternative courses of action and their probable consequences. This helps them to think in an orderly fashion, to make logical decisions, and to widen their vision of opportunity.
4. We must give the learner guidance in developing skills in the use of his new tools.

It is my opinion that, by doing these things, we can most effectively contribute to the attainment of the objectives of farm and home development work.

EVALUATION OF EXTENSION METHODS EMPLOYED IN FARM AND HOME DEVELOPMENT IN THE NORTHEAST

P. L. PUTNAM
University of Connecticut

BEFORE evaluating extension methods used in the northeast states in farm and home development, it is necessary to state briefly some of my concepts of farm and home development. Farm and home development is a method of doing extension work—it is not a program. In the early stages many extension workers in the northeast considered it a separate program. This mistake, I believe, has been largely overcome, and most extension workers in the northeast recognize that it is a method of doing extension work. In most part, they understand that the advantages of each separate improvement are not fully utilized until all are integrated into a good, sound, economic unit. To do this requires planning.

It is fairly well agreed that successful farm and home development requires cooperation and coordination of all extension workers, specialists and county workers. The approach can, and should, become a part of many of our regular organized extension projects. Farm and home development can be carried into production fields—agronomy, nutrition, dairy herd improvement and many other established programs. Farm and home development stresses the point that wise use of resources must be tailored to each farm unit, and that the management decisions in any segment influence the entire farm unit. Many of our present extension programs provide much of the basic information, and when carried further, can be developed into a sound farm and home development procedure.

The primary objective of farm and home development is to teach farm people how to make sound decisions in the operation of the farm business and the farm home. Most of the leaders in the northeast states agree with this. However, there are some extension workers who believe you are not doing farm and home development work unless you carry through, with a farm family, a complete farm and home plan. I do not object to farm people developing a farm and home plan. It is an excellent procedure to use to teach decision making. However, a farm plan, once developed and put on paper, is not the end product. No one has the ability to do the job once and for all. Farmers are confronted with the weather, changes in costs and prices, new techniques and practices and new machinery. A farm plan must be adjusted from time to time to meet the changes that occur. A farm plan is a guide. Farm and home development is a continuing practice just like feeding farm animals. The important thing is how to make sound decisions that confront the farm family from week to week,

from month to month, and from year to year. Farm and home development is an educational device that helps each farm family work out the wise use of resources in the farm home and the farm business for a happy farm life. Production and consumption decisions must be made continuously for the farm and home business. Plans must be flexible to meet changing conditions and must be adjusted frequently.

The only effective tool that farm families can use in testing the possible effect of adjustments before actually committing the resources is an estimating process called budgeting. A budget is an estimate of the change in costs and returns which results in any time period from a change in production and/or consumption practices. In budgeting changes in the farm business, usually costs and returns are expressed in money terms. Other expression of returns such as tediousness, high physical risks, ease of doing a job, and pride of ownership, should be used. In budgeting changes in the farm home, costs are expressed in money terms, but returns are expressed in terms such as time saved and leisure time resulting, improved health, ease of doing the work in the home, better recreation, etc. Budgeting by the manager of the home is more difficult than that of the manager of the farm business because the value of home improvements generally cannot be expressed in money terms, but must be expressed in returns of satisfaction.

The managers of the farm and farm home must make decisions. Decisions have to be made in relation to some existing objectives. These objectives or goals vary with each farm family. Although objectives differ for farm families—each one will try to use his resources as effectively as possible to achieve the maximum amount of his objective. The process of decision making on farms are many. Decisions are made through habit, rules, or intuition, which are useful devices for simple routine problems. On major management problems on the farm or in the home, rules, habit and intuition cannot be trusted to use resources effectively. Here the budget method should be used and we, in the northeast, believe so far it is the only alternative that farm families have in testing decision making.

Budgeting is a tool that each family can use to test the effect of possible changes before actually committing the resources. Budgeting several alternatives is a logical process to use in deciding how resources should be used to maximize the goals.

In budgeting there are two forms—complete or partial budgets:

a) The complete budget estimates total returns and total costs and resulting profits for each alternative organization. Comparison between profits will permit a decision on the use of resources. About the only need for using the complete budget is where extensive major changes of the entire farm

business are made, or when a man is just starting to farm or is contemplating purchasing a farm.

b) The partial budget is used to estimate the change that will occur in present profits by considering only the additional costs and additional returns which are influenced by various alternative plans. Comparison among net influences will permit a decision on the use of resources. The partial budget is simple and requires much less time.

The managers test out changes that are related to a particular problem they have identified. In using the partial budget, many costs and returns remain the same and need not be considered in the appraisal of a particular alternative. Both budget methods recognize the same economic principles, and if done well, will lead to the same conclusions on the wise use of resources. The partial budget is by far the most useful tool in teaching decision making.

Some of the extension people in the northeast who are working on farm and home development understand the principles and mechanics involved in budgeting. Some do not. More educational work with extension workers is needed before they can effectively teach farm and home development to farm families. We, in the northeast, are open-minded in using new methods of procedure. A committee has been appointed to study the block system as outlined by some of the midwestern states to determine whether or not it is adaptable to northeast conditions. We believe that if it is applied properly, and worked out well, that it might be used for some adjustments, and it would reduce the time of farmers required in budgeting. After studying publications that describe the block system, we understand that the block method is budgeting that ties numerous items into one. The mistake, I believe, that this group made was that they did not do a good job in their budgeting. They failed to recognize that every going farm business has fixed costs. The budget used was built up on cost accounts which include fixed costs. If the group had included only variable costs in building up their blocks, and devised a system of handling changes in resource expenditures that would occur when changes from one system to another are made, I would be all for it. It is my opinion, in its present form, that it will not give the farmers the right answer.

There are many kinds and types of teaching programs that can be used in helping farm families in decision making. It can be done individually–in small groups–in large groups–and through special problems. Some of the states in the northeast are concentrating on the individual approach; others on the small group approach; others on a special problem approach; and a few states are using all four methods. It is through the use of all methods that the best results will be secured. We believe that

as experience is gained that all counties in all states will use several methods in teaching the unit approach to farm families.

In carrying out the planning process, regardless of the approach used, the manager of the farm business or the home should perform several major steps. They are:

(1) Size up the situation—an inventory of resources and present organization and practices. What is available on which to build plans.
(2) Long-term goals—what is wanted in relation to the ability to achieve it.
(3) Determine alternatives—certain resources, techniques, skills and desires are available. The problem is to combine these so that the maximum profits from the farm business, desires and satisfaction in the home are achieved.
(4) Make decisions and take action—moving from where they are to where they want to be. In the testing process the budget method is used.

Individual Approach

Many of the states in the northeast have felt that one of the best ways to get into and secure the necessary experience in doing farm and home development is by using the individual approach. As extension workers gain experience they plan to develop gradually other methods suitable to their counties.

The counties that are concentrating on the individual approach can, with the same time and effort, reach more farm families than if they concentrated on the approach in small groups. The counties that are working primarily on the individual approach have to guard against doing the planning for the farm family rather than having the farm family do their own planning. It is easier to err in this direction when the individual approach is used than when other methods are used. A farm and home plan, or the solving of a problem, must be developed by the farm operator. This is a must. The farm operator's knowledge of the farm, his resources and methods, put him in a better position to do the planning than anyone else. No one knows his abilities or capacities better than himself. The real job of making the necessary changes in operations and organization in the farm business and improvements in the home are more apt to be made if the farm and home operator does the planning.

Small Group Approach

The small group approach has been used in a number of states very effectively in teaching farm families how to make sound decisions. It is probably the best educational approach used in developing an understanding on the part of farm people in regard to how to solve the problems that confront them. Methods and problems can be discussed and analyzed effectively in small group meetings.

In organizing the groups it is essential to secure as much unity as possible in regard to types of problems that may arise. It is much better to have all dairy, or all poultry, or all vegetable, than to mix the group.

In the small group approach we have to guard against doing things that the farmers have already done. For example, projecting receipts, expenses and income statements, when farm accounts are kept, is a waste of time. The use of too detailed and complicated workbooks should be avoided.

Special Problem Approach

Several states are using the special problem approach. In Connecticut we have used all four methods, but one of the most productive pieces of work in farm and home development procedure started with an agronomy program. In the spring of 1953 a forage planning program was begun in all counties of the state. Groups of farmers gathered in community meeting places and went through a forage balancing process using the Connecticut Forage Program Workbook and Handbook with the guidance of a county representative and a specialist from the farm management or agronomy department. In the first two years, 293 farmers participated in these meetings.

The major objective of the program was to have farmers appraise their present forage production in the light of the needs of their present livestock program if the livestock were fed at a relatively high forage intake throughout the year. Once the appraisal was made, forage production practices were outlined which would lead to an improved balance between forage needs and requirements. These crop adjustments were then related to other changes in the farm business that were necessary to maximize income.

In order to test the impact that forage adjustments have upon the profitability of the farm, a farm management study was undertaken in 1953-54. A random sample of the participants was obtained and each farmer so selected was contacted by personal interview. These farmers were separated into five size groups based upon the number of cows in the herd as follows:

	No. of cows	
	Range	*Average*
Group I	6-19	14
Group II	20-29	25
Group III	30-39	33
Group IV	40-49	43
Group V	50-79	63

The study was limited to those adjustments that could be achieved without major changes in land acreage, equipment, buildings or labor.

It was the objective of the study to demonstrate that improvement in net income from the dairy business could be achieved by simply using present resources more effectively. In general, the program was

(1) the intensification of crop production from the existing cropland acres by improved fertilizer practices, crop selection and rotations,
(2) a shift to grass silage or barn-finished hay to conserve forage quality and to store early surpluses in the pasture period for later use as supplement during the period of low pasture yields in late summer and fall, and
(3) the maintenance of present concentrate feeding levels and some additions to the herd.

Adjustments to improve forage production and use were quite similar for each farm group. However, the extent of application of the adjustments varied considerably. The effects of the general program upon net income for each sized group are shown in the following table:

Estimated Effects of Forage Planning

	Groups				
	I	II	III	IV	V
			(percent)		
Possible increase in total quantity of forage	80	47	21	27	13
Possible change in total expenses:					
Present herd	—1	4	4	8	6
Increased herd	19	21	9	14	8
Possible increase in net farm income:					
Present herd	65	46	26	20	11
Increased herd	131	89	37	38	16

The extent to which forage production can be increased and the effect upon costs and return varies considerably by sized groups. In practically all cases forage improvement programs increased total production costs as more fertilizers, seed and supplies were required. In spite of this fact, net income was increased substantially.

The special problem approach offers a real opportunity to do sound work in farm and home development.

The Large Group Approach

The large group approach can be used effectively in teaching decision making. The case method has been used to illustrate the procedure. Actual farms have been used and the procedure followed has been first to present a clear picture of the present situation on a farm. That is, what is available to build plans. In the next step the goals of the farm family were stated and discussed. In the third step the various alternatives that this farm family was considering were outlined and discussed. The decisions of the farm family in regard to changes and adjustments were presented. Then the final decisions, along with other possible alternatives,

were tested by use of the budget method. The prime objective was to outline a procedure and method that could be used by farm people on their farms. It was emphasized that changes and adjustments were those arrived at by the farm family, and that the important thing was the procedure and how this farm family arrived at their decisions.

Farm and home development is not an easy job. It requires extension workers with experience and training in the technologies of agriculture and home economics, as well as farm management. There are certain qualifications that extension workers should have to guide and teach farm families to plan for themselves. They are:

1) Extension workers must know the alternative opportunities available to an area and farm family.
2) Extension workers must know a sound method of evaluating these alternatives. They must understand that there are fixed costs that exist on every farm. They must understand the importance of utilization of available resources. The best tool in testing these alternatives is the budget method.
3) Extension workers, in the use of the budget method, must know prices, cost of inputs and be familiar with outlook information in regard to various agricultural enterprises.
4) Extension workers must know most of the technologies of agriculture and home economics, or know where to get the technical information that is needed.
5) Extension workers must have the ability to teach this body of information as it applies to the farm and farm family.
6) Extension workers must have the ability to motivate the farm family to go through this decision making process.

This is a hard job and educational work with extension agents must continue. Sound planning on farm and home development provides one of the most effective methods by which extension workers can aid farm people in making changes in farm organization and practices that will lead to more efficient production, improved income and a satisfactory living for farm families.

EVALUATION OF EXTENSION METHODS EMPLOYED IN FARM AND HOME DEVELOPMENT IN THE SOUTH

M. S. WILLIAMS
North Carolina State College

Introduction

MY COMMENTS on what is going on in other states in the south are based on discussions with representatives of other states, and the minutes of the Southern Farm Management Extension Committee. I have summarized what I think is taking place, but do not propose to present a comprehensive review of methods in farm and home development being used in the south and hence may not accurately present recent developments.

The background, objectives, and philosophy of farm and home development have been amply covered by Dr. Nesius, Dr. Ratchford, and others on the program in the previous session on this topic. I will accept the statements of Dr. Nesius as my point of departure.

Review of Farm and Home Development in the South

There certainly are as many different approaches to farm and home development as there are states, and I suspect that there are as many approaches as there are counties. Many of the differences are relatively minor, but a generally accepted pattern, especially as to methods used, does not seem to have emerged at this point. This is desirable and will result in greater benefits than were we all attempting to follow the same plan.

I believe that I can make a few generalizations about work in the southern states in the redirected extension program. Generally, the approach in employing additional personnel has been to hire experienced people. This experience has been with extension or other agricultural agencies, and does not imply experience in farm management. These additional workers have been in a relatively small number of counties, usually in a ratio of two farm agents to one home agent. In most cases, the additional personnel have been hired specifically to work with farm and home development families. Most states seem to have used a state committee to formulate plans and suggestions as to how the redirected extension program might be most effectively implemented in their respective states. Also, most states have had a training session for the assistant agent working specifically on farm and home development. These have varied apparently from 2-day conferences to three weeks of training.

There is an effort to expand the farm and home development approach with a limited number of families in counties other than those where additional workers have been placed. In most states, farm and home development in the south is being carried out under the administrative leadership of the extension director, or assistant director. However, in some states special personnel have been given the responsibility for farm and home development work.

Usually, farm and home planning is considered to be an essential part of the unit approach. In some cases, the agents are expected to develop a complete farm and home plan with each family; in others, the use of farm and home planning has received little emphasis.

Generally, in the south, farm and home development has proceeded at a surprisingly rapid rate. I believe one of the reasons has been the experience with the unit test demonstration program in cooperation with TVA over the past twenty years. Also, the experiences of working with low income families in the TVA areas of the southern states in recent years have been very valuable. Many states are tending to tie the unit test demonstration program in with farm and home development work, and to model the work around the states on the unit test-demonstration program.

Most states apparently are emphasizing individual contact and the individual visit as the principal method in achieving the objectives of farm and home development. In some states the emphasis has been almost entirely on the individual approach. In other states the emphasis has been largely on the group approach with group planning as the core of the approach. In other cases, the special problem approach is being used as a basis for beginning work with families using the unit approach.

Problems

One of the major problems that has concerned me, and I am sure all of you, is the part that agricultural economics and specifically farm management has to play in the unit approach of farm and home development. One of the fears that I have heard expressed by extension administrators has been that farm management will take over, and by so doing build up sufficient opposition on the part of other subject matter departments to kill the work before it has a chance to be proven.

The role of the farm management specialist seems to me to depend largely on the methods that will be used to put "an economic base under every farm." This statement implies that economics play a large part in this redirection. If the real need is a method to use in deciding how to organize, combine, and use resources, then the most effective technique available is farm and home planning. The redirection of extension efforts

involves the reorientation of the thinking and efforts of all extension workers. This means the use of the planning, or farm management, approach in working with individual families. The agricultural economist then becomes an educational specialist for the rest of the subject matter specialists and county staffs. Of course, we shall continue to be dependent on all subject matter areas for our technical knowledge. Certainly, we can hope this will result in more meaningful research as well as more efficient educational efforts.

There are two distinguishing features to farm and home development:

(1) This is an attempt to secure adoption and use by all extension workers of the idea of the whole unit—farm, home, family. Here the important characteristic is the approach used in working with farm families. To me, the approach is the one we have been advocating as the farm and home planning approach. This is the difficult job, to see that this approach is used.

(2) The other distinguishing feature is that individual contacts and visits will be used, rather than the group or mass media approach, where we talk in terms of averages. This seems to have been generally accepted and will be used as one of the principal ways to get the job done.

I am not sure that I have been able to tell where the farm management role starts or where it stops, but I feel that it is extremely important that this role be defined so that we do not give the impression of taking over the whole extension program. We actually seem to be heading in two directions at the same time. In one direction, we are going back to the method of individual visits to the families to assist them with problems, establish mutual confidence, and, over time to assist the family by teaching them with a technique to develop a complete farm and home plan. The other direction that we seem to be going is that of the mass media approach even more so than we have over the past few years. Actually, we are still in the in-between area with part of the county extension staff visiting a limited number of families and giving them intensive assistance while the rest of the county staff is continuing to visit other families in the county on somewhat of a problem approach and are still about half way toward the truly mass media approach.

The two major problem areas as far as methodology is concerned seem to me to be:

(1) How can the planning technique be taught to all extension workers so they will accept and use this approach in their everyday work?

(2) To what extent should farm and home development be done on an individual basis and to what extent should group techniques be used?

I doubt that the first question can be answered by administrative decree that all workers will use the planning approach. Certainly, strong admin-

istrative leadership is a must. I believe we have the leadership in our directors in the south. However, in the final analysis, agricultural and home economists have the job of teaching and demonstrating the approach.

I wish I knew an easy way to secure acceptance of the idea of farm and home development as outlined earlier. We need to recognize that many of our agents and specialists still consider the special problem approach—a piecemeal approach—the way to do extension teaching. They still do not have the concept of the whole unit. They are depending on individual contacts to uncover the problems and give them something to work on, but are still using the enterprise or practice approach. The only lasting solution I see is for farm management workers to be smart enough and productive enough to convince other extension workers that looking at the farm and family situation in terms of the whole is a more effective and productive way to conduct an educational program with farm families.

The individual vs. the group approach is difficult to evaluate since both are used, with varying emphasis on one or the other. Since we are trying to get away from averages to specific situations, group meetings are a poor way to assist the family with individual problems. The best that can be expected to be taught on a group basis are principles or methods. With the heterogeneity of resources among farms, I fail to see how we tailor information to the individual situation through group methods.

Group planning meetings have been successful and helpful and should continue to be used. However, the most we have been able to do has been to teach the planning technique. Most information has been given in terms of standards and examples. This is inherent in the group approach.

The individual case study of the family's resources and alternatives needs to be done on an individual basis, preferably on the farm and in the home. To reach the objectives set up for farm and home development, it will be necessary to take the goals of the family and provide specific information that will help to organize the farm and family living to achieve these goals.

I realize that group methods will become even more important in the overall extension program in the future. I also recognize that, for many objectives, the group method has advantages over the individual approach. However, to do what has been set out as our job in farm and home development, I am convinced the extension worker must rely heavily on the individual approach.

Let me briefly comment on the various forms and training material being used in farm and home development work. I believe that most extension personnel, other than farm management specialists, are complain-

ing about the complexity of farm and home development work. They complain particularly about a complete farm and home plan, a complete budget, record books, planning forms, and the like. The biggest arguments seem to be that these things "scare" the families. If we are sincere in saying that we will start with the families where they are and try to help the families help themselves there is validity in these objections. Certainly all families are not on the same level and never will be. The insistence on the use of a number of forms results in the elimination of many of the families that we are trying to reach, the families that extension has not been reaching in the past. The important thing is that the families are assisted in thinking through problems in terms of their own unit, and not that a particular kind of form is used and that certain information is written down. Some of the best farm managers that I know in North Carolina do an excellent job of planning and do some figuring, but do not use a complicated and detailed planning form.

I leave the consequences of farm and home development for next year's program.

EVALUATION OF EXTENSION METHODS EMPLOYED IN FARM AND HOME DEVELOPMENT IN THE WEST

ARTHUR W. PETERSON
State College of Washington

ONE of our problems as farm management specialists is to clarify our own thinking on farm and home development so we can explain the concept to others. What is farm and home development? What are the objectives of this method?

Most extension farm management specialists in the west regard farm and home development as a method of extension education rather than as a farm management project. Our conclusions on the subject were submitted to our directors as a committee report entitled "The Farm Unit Approach to Problems of the Individual Farm and Home." This report emphasizes that farm and home development is a method of teaching farm families a systematic approach to management decisions for the farm and the home as an integrated unit. I must admit, however, that it is easier to give lip service to the idea than it is to put it into practice.

Training the Staff

This has been the principal accomplishment of our work in Washington and most other western states to date. This past year we have held five district training meetings with county staffs, one with the state staff and numerous sessions with individual county staffs.

Mrs. Lila Dickerson, Home Management Specialist, and I work as a team. We always demonstrate our methods using an actual farm family selected by the local county staff. We assume the role of county agents in the training process.

Frequently the county agents have asked a farm family to cooperate as a personal favor assuming that the training session would be a "dry run." In no instance that I remember, however, has this been the final result. The farm families become so interested that they want to follow through.

We find this laboratory approach an effective method of teaching, which demonstrates to the county staff that the method works. The usual enthusiasm of the farm family aids in selling the method.

Following the work with the individual family we sit down with the county staff to evaluate this extension method and to think through the staff follow-up with the farm family. At the end of the first year we return for an evaluation of results with the same farm family serving as the "live situation" to demonstrate this part of the method. We have developed an evaluation form to be used by the county agents and the farm family. It, together with the office records kept for each farm family, should provide

case study data for annual county reports and research information for our own evaluation program.

May I emphasize again that in training we (1) use the team approach; (2) insist on working with an actual farm family; and (3) use the same systematic approach for all farm families.

Our extension staff has had more difficulty than the farm families in understanding the concept and appreciating the value of farm and home development. This is understandable. All farm families have practiced to a degree what we are trying to teach. Our extension staff has not. In fact, most of them were trained as specialists in college and have been reasonably successful in approaching problems as isolated from the total unit approach. They have practiced the art of looking at specific problems and of making specific recommendations, rather than conceiving of problems as a part of the total unit and of approaching solutions as alternative choices. Because of this and other reasons we find difficulty in stimulating them to use the method even after we think they understand it.

I'm sure that other states have a similar problem. We are trying to improve on our training methods:

(1) by using a group community approach, teaching as many parts of the process as possible on a group basis,
(2) by asking the administration to designate leadership and responsibility at the county level in much the same way that they have given Mrs. Dickerson and me leadership at the state level, and
(3) by suggesting to the administration that we offer a more formal training course with college credit to county staff personnel who are to be given leadership responsibilities.

In passing I would like to suggest that our college training curricula and courses need re-examination if we are to be most successful at this job in extension.

One phase of our training program that will receive emphasis this fall is evaluation of results. As I stated previously in all cases each farm family has established certain base points in their farm and home plan, including goals that can be checked later and evaluated prior to making plans for another year.

Preparing Materials

This is an important part of the farm and home development method. In Washington and most western states a workbook has been developed as an aid to farm families. Our workbook is designed as a planning tool for the farm family. We do not expect it to provide farm management research materials but it is designed to provide a base for evaluation of change by the farm family and for later evaluation of the program.

Other parts of this conference have given special emphasis to research

and economic subject-matter information needed by extension personnel and farm families as they develop and carry out farm and home plans. I would like to mention a few ideas that I have found practical.

As a part of our training with farm families we demonstrate the use of farm and home budgeting. In order to simplify the procedure we have the farm family estimate the core of their expenses, both farm and home, that are fixed and not subject to alternative choices, except of course, the choice not to operate the farm. A few families, when faced with the facts, have made this latter choice.

Space is provided for planning a family living budget excluding capital investment items that we assume are subject to choice. Present obligations are first listed in the financial statement as current liabilities and then transferred from there to the farm-home budget sheet. Other fixed or semifixed farm expenses are estimated and entered on the budget sheet. Up to this point all alternative budgets for the farm and home are the same.

The various segments of the farm and home business are then approached as parts or enterprises. Either an entire field can be changed from one crop to another or changes in alternative practices can be shown and easily built into a budget for the entire farm and home unit. Livestock enterprises can be added, subtracted, or changed and fitted back into the over-all budget with a minimum of effort. We assume the "fixed expenses" to be the same for all budgets.

When starting on this work I found a lack of production and economic information, not only for the state as a whole, but especially for local soil, climatic and marketing conditions. An approach developed by California farm management specialists has been used to help overcome this handicap. The county agent invites a few farmers from a particular area to meet with us to develop input-output standards for different enterprises for their locality. Our job has been to systematize the approach. The results, of course, are not statistical averages of any kind but farm families and the county agents find them useful. The local county develops a loose leaf note book and sometimes publishes the results. We always allow for a column headed "your estimate" so the individual family can make additional adjustments.

Using the Method in an Extension Program

Getting county and state staffs to use the method is our most difficult task. I would outline the job breakdown as follows:

1. Selecting participants.
   (a) Individual case approach
   (b) Group, community approach

2. Organizing the staff to use the method.
   (a) Providing time
   (b) Determining leadership
   (c) Integrating the staff
3. Using the method in extension program planning.
4. Using program result demonstrations.
5. Recognizing personnel improvement with salary increases and other forms of recognition.
6. Evaluation of results.
7. Information and reporting.

Our experience does not provide much basis for evaluation to date. Fortunately our administration recognizes the need for research and evaluation. A person from the extension administration has been designated to spend full time in evaluating extension programs and methods.

Our action program in farm and home development has been planned so it can be evaluated. For example, we are trying the group approach on a community basis. Our Rural Sociology and Agricultural Economics Departments are cooperating in the design, in gathering background information and will take leadership in the interpretation of the results.

The rural sociologists and agricultural economists will select comparable communities (in one or more different types of farming areas). The farm and home development method will be used in one of these communities but not in the other. Our administration is assigning a special team, a county agricultural agent and home demonstration agent, to the test counties where the group-community approach will be tried. Our research departments will evaluate our individual case approach.

The research project is designed to run five years. We will evaluate changes (1) in our extension program, (2) in farm and home practices, (3) in decision making ability of farm people, and (4) in community characteristics.

This paper has presented an evaluation of farm and home development methods in the western United States. Because I know the program of the State in Washington most intimately I have centered most of my remarks on our experience in that state.

EVALUATING EXTENSION METHODS USED IN FARM AND HOME DEVELOPMENT: REAPPRAISAL*

JAMES NIELSON
Michigan State University

IN MY PAPER I would like to stress two points in regard to farm and home development methods. First, after nine years of experience in extension, part of which has been devoted to farm and home planning work, I have a very strong feeling that people in extension work need to show more imagination and initiative in trying out farm and home development methods. There is now an urgent need for more effective methods of working with farmers individually and in small groups. We are badly in need of methods that will speed up the rate at which we assist farm families in our farm and home development work. I am frequently appalled at the low sights that many of us set for ourselves in regard to the number of families to be worked with. I do not believe that the national and state legislatures that have appropriated increased funds for this type of educational work will be content unless the number of families assisted is steadily and fairly rapidly expanded.

When speaking of experimenting with new methods, the question inevitably arises "Can Extension afford to experiment?" That is, in working with farm people dare we take a chance by trying out a new approach that may not work out? As a practical matter of course, we don't want to make too many mistakes in working with farm families. But I believe that farm people have sufficient confidence in the extension service that they are willing to have us try out new methods having possibilities of improving the effectiveness of the service. My conclusion is that we can safely experiment with new approaches and that we are obligated to do so. Extension is now a 100-million dollar business. We ought to spend at least 5 million dollars of those resources each year to find out how to use the other 95 million more effectively.

The second point that I would like to make is that we need to do more formal evaluation research on farm and home development methods. We need to outline specific methods, try them out, and evaluate their effectiveness—using the best statistical techniques that are available. I do not mean to discount the importance of informal or subjective evaluation. I am now in the process of conducting formal research to evaluate the "Experimental Township Extension Program" in Michigan. I know that I will have to supplement our statistical measures with considerable subjective analysis in arriving at conclusions. But the point is that the informal judgment-type of evaluation is inadequate when we have as much

* Journal Article No. 1817 of the Michigan Agricultural Experiment Station.

at stake as we now have in farm and home development. People in extension have been talking seriously about farm and home planning for about 15 years, yet I believe that most of us would agree that only a very modest amount of work has been done along this line. Why haven't we done more in this area? Lack of funds has not been the only reason. We have not had the answers to such important questions as the following: How should the extension service be staffed to do the job of farm and home development? In the county, should the work be done by the regular county extension staff, by agents assigned specifically to farm and home development, or by a staff of subject matter specialists? How should the work be administered at the state level—by someone attached to the director's office, by a committee, or by the farm and home management specialists? What number and kind of specialists are needed to support the work? How should the cooperating families be selected? What teaching methods are most effective in working with farm families? All of these questions need to be answered if farm and home development is to become an important way of doing extension work, and formal evaluation research is part of the process of finding the answers in each case.

Thus far only a limited amount of evaluation research has been carried out in connection with our farm and home development work. In recent months there has been increased evidence of interest in evaluation research. In response to a letter from Administrator Ferguson to the state extension directors in January 1955, about 15 states submitted proposals for projects to evaluate the farm and home unit approach in their states. Several of the research projects have already gotten underway. There is a need and an opportunity for the various states, in cooperation with the Division of Research and Training of the Federal Extension Service, to coordinate their farm and home development research programs so as to obtain more comparability of results, to make sure that all of the criteria of success that may be relevant are tested, and to insure that results are obtained over the wide range of circumstances existing around the country. Much remains to be learned about the most effective methods of conducting evaluation studies. We don't have all of the answers by any means, but from the experience that we have had in evaluation research, it seems to me that the process of evaluating extension methods from the standpoint of their usefulness in farm and home development involves the following six steps:

1. *State the objectives of farm and home development.*

We can't evaluate anything about farm and home development until we know what we're trying to accomplish. In order to do a serious piece of evaluation, we must decide what kinds of changes in farm people or in

their farms or homes will be acceptable as criteria of success of the endeavor. Examples of areas in which desirable changes may be found are family values, goals and attitudes; level of living; ability to make sound farm and home management decisions; volume and efficiency of production; net farm income. To the extent that the accepted measures of success have economic implications, the agricultural economist has a role in evaluation (along with the rural sociologist, the home management specialist, and others).

2. *Specify the farm and home development methods to be used in attempting to reach these objectives.*

The method might constitute work with individual families on their farms, work with families in small groups, work with families in large groups, work with families in various sized groups followed by work with them individually on the farm, or teaching farm and home development principles via an extension television course. A good example of experimenting with methods is the test of the farm practice approach versus budgeting, versus the teaching of decision making which has been planned by the Kentucky Extension Service. The most fruitful approaches for research will probably consist of combinations of methods rather than a single method.

In addition to experimenting to find out which methods or combination of methods are most effective, we need to experiment to find out which methods are most effective under different situations—such as educational levels, income levels, and nationality groupings. We need to determine optimum intensity or farmer-to-agent ratios under different circumstances. We need to find out how long it is necessary to continue our farm and home development work at different levels of intensity with individual farm families.

3. *See that the relevant extension workers understand and follow the method for a long enough time to put it to a test.*

We not only need to specify the method, but we need to be sure that the extension workers who are going to be trying it out with farm families thoroughly understand the method and follow it. Of course we like to pride ourselves in being flexible and willing and able to adjust as new information becomes available. Some would argue that the evaluator should merely record the methods employed by the extension worker, allow him to shift methods as he thinks desirable, and then attempt to evaluate the methods which were in fact employed. I do not believe that we will ever get the evaluation job done in this manner. Someone needs to stay put long enough to find out how effective a method really is. After

all, most of the extension workers will not be directly involved in the formal evaluation research and thus will be as free as they have always been to adjust their teaching techniques. Seeing to it that the specified methods are followed will call for strong administrative action in some cases. In other cases the people charged with the responsibility of carrying out a farm and home development endeavor are so unsure of their methods that they would welcome having a promising method outlined in detail for them to follow. In any case it is the evaluator's responsibility to advise the administrator as to the kind of action that is necessary to get reliable research results.

4. *Collect data from a sample of participating families.*

First of all we need to get information to show where the participating families were when the program started. Then we need to gather data to show what progress the families are making as the program moves along. Finally we need to gather terminal data to determine how far the families had gotten by the end of the experiment. From these data we can draw conclusions regarding the changes made by cooperating families.

5. *Set up controls.*

To find out how much of the progress made, if any, should be attributed to the method employed, we need to set up control groups from which we gather the same kind of bench mark, intermediate and terminal data as are gathered from the experimental sample. The control can consist of a group of families that are matched to the group of participating families in regard to the relevant variables such as, for example, characteristics of the farms, family composition, and educational level. The criteria for selecting the control samples will be different depending upon which criteria of success are being measured. Ideally the only difference between the experimental sample and the control sample would be that one group participates in farm and home development and the other does not.

The question arises as to whether or not we can keep people in the control from participating in farm and home development if they should become interested (in order to maintain a control for evaluation purposes). During its forty-year history, extension has kept most of the farm families who might have been interested waiting for the farm and home development approach. At best only a fraction of the total can be reached with this approach during the next five years. Surely work with a limited number can be postponed for a few years in order to complete an important research program.

6. *Analyze the data and draw conclusions.*

The final step in the evaluation process would be to analyze the data and to draw conclusions regarding the effectiveness of the various farm and home development methods and combinations of methods. Computation of cost-benefit ratios will be useful in determining the relative effectiveness of methods as well as in determining the optimum intensity of working with farm families in our farm and home development work. Subjective analysis of course will be an important part of this step.

Of course administrators will need to consider other information along with the results of the evaluation research in arriving at decisions regarding the methods to employ in farm and home development, but formal evaluation can make a valuable contribution to the administrative decision making process.

INTEGRATION OF RESEARCH AND EXTENSION IN AGRICULTURAL POLICY

Chairman: G. B. Wood, Oregon State College

INCREASING FARMERS' UNDERSTANDING OF PUBLIC PROBLEMS AND POLICIES*

J. Carroll Bottum
Purdue University

FOR the purpose of this paper I am assuming that the objective of education in public problems and policies is (1) to develop an active interest in public policy problems, (2) to increase understanding of the facts, issues and values involved, (3) to improve peoples' ability to make judgments on public policy issues on the basis of a critical examination of the evidence and logical analysis, and (4) to create a desire and an ability to participate effectively in the solution of these problems.

This is a teaching and learning process in which the same principles apply as in teaching and learning. I will refer to some of these principles as I proceed. Since I assume that you as educators are all familiar with them I shall not take time to state them here. For those who wish to review them with particular reference to policy, I should like to refer you to Dr. Ralph W. Tyler's brief and clear statements in the report of the 1953 Extension Workers' Policy Training Conference.

The Major Issue

The real issue that arises in education in public problems concerns the approach that an educator, supported by all society, is able to use to justly protect the value rights of all citizens and still allow for effective teaching. Also the research worker cannot fully escape this problem if his research is to contribute most effectively to education in this area. The wide divergence of approaches used by agricultural economists induced the writer to accept the invitation to prepare this paper even though of necessity it must be based largely on experience and observation. This phase of the problem receives a major share of my attention. If one questions this divergence of views relative to the approach to educational problems in policy, let him review the articles in the *Journal of Farm Economics* for the past decade and examine the approaches that have been used to appraise the virtues or the evils of the various public programs that have been analyzed. I believe an educator in public policy should be a social scientist or at least be familiar with the other social

* Journal Paper No. 896.

science disciplines. However, I shall refer to public policy workers as economists as this is the title under which we labor.

Some land grant colleges are still hesitant to move aggressively into education in public affairs because they question that a satisfactory educational technique has been found for working in this area. Many economists and other social scientists have not fully recognized the limitations of their disciplines in the solving of public problems. Economists have carried the analysis of public problems beyond the scope of economics in the name of economics. This failure to separate clearly the part that economics plays and the part that individual noneconomic values play has gotten the economist into trouble. Questions and doubts concerning educational programs in policy have been raised in the minds of both educational administrators and the general public.

People's decisions, opinions or judgments concerning public problems are based on their beliefs and their values. In expressing their opinions people express both their beliefs and values at the same time. Usually they do not distinguish between what they think they know and what they like and dislike. Nevertheless, this is the basis of decisions in the public policy area. In our educational process we must recognize the basis of their judgments and be prepared to treat each of them properly because they require different approaches.

In this presentation I shall use beliefs to refer to facts, concepts or relationships existing among facts. A person's belief used in this sense can be objectively judged to be true or false. Beliefs refer to reality. To deny in a practical sense that there is a body of provable economic facts and concepts as some economists do is to deny the science of economics and the contribution of economic research. Although there is still much that is not known, there is a large body of provable economic facts bearing on nearly every public problem.

I recognize the philosophical concept that some economists take that no facts are provable. I take no exception to this as a philosophical concept. Nevertheless, the general public recognizes that there is information in the economic area that can be used as practical guides. They know that society has moved forward by the use of such information. They are interested in more information of this nature. We are here engaged in a practical approach to policy education. I agree with Dr. Geoffrey Shepherd that we are not concerned with philosophical concepts that lead us into dead-end streets when there are open roads ahead.[1] Physical scientists could be diverted equally well by this concept, but most of them are

[1] Geoffrey Shepherd, "What Can a Research Man Do in Agricultural Price Policy," *Journal of Farm Economics*, May, 1955, p. 312.

not. Therefore, what I mean by provable is those facts and relationships that at any given stage of knowledge are accepted by intelligent, informed, practical men.

The term "values" refers to the individual's feelings towards what is justice, equity and fairness. The attitude each individual has concerning these values depends upon each individual's environment, religious and cultural background. These values cannot be judged by objective standards. The public policy worker is beyond his science when he attempts to change these for individuals except insofar as a clearer understanding of economic concepts may influence the individual's values.

Individual farmers hold certain values relative to security and freedom. One individual may be willing to go further in giving up freedom for security than another. No person can make assumptions for another in this area. The fact that one individual will give up some freedom for a little more security does not mean he does not hold freedom in first place, as Dr. D. E. Hathaway so well points out in his article in the *Journal of Farm Economics.*[2] He simply may give up a marginal unit of freedom for a marginal unit of security. Each individual has to seek a compromise among his conflicting values just as a society in total must find a compromise among the values held by the different individuals. This is the same type of compromise that a farmer makes between corn and legumes. Up to a certain point corn and legumes in the Corn Belt may supplement each other, but beyond a certain point they are competing.

Thus, we come back to the basic problem of using an approach that allows the economist to increase the farmers' understanding in the public problems area without inflicting the educator's values upon them. I should like now to set forth the five approaches that various individuals and groups use to influence policy.[3] At the same time I wish to appraise their appropriateness and effectiveness from the standpoint of educators who are publicly supported.

Approach I

A presentation of facts and trends or an explanation of public programs with no analysis of issues or their implications. Both of these presentations can be made without the economist going beyond his economic limits and without getting into difficulty. Sometimes the economist's job is to explain the workings of a new program. If it is a new program and affects

[2] Dale E. Hathaway, "Agricultural Policy and Farmers Freedom: A Suggested Framework," *Journal of Farm Economics,* November, 1953.

[3] J. Carroll Bottum, "Methods of Presenting Economic Data to Farmers," *Journal of Farm Economics,* December, 1952.

many farmers, there will be sufficient interest so that they may attend meetings in large numbers, read written presentations, watch television, or listen to the radio. The explanation of the old age and survivorship program at the present time is an example.

The presentation of facts and trends provides valuable background for policy. However, unless these trends are related to the solution of a particular problem, they have limited appeal whether presented at meetings or through the other means of communication. There are a limited number of instances where such presentation of economic data with little interpretation of their implications has a place. However, it does not seem to me that this can be classified as policy education in most cases. Furthermore, the presentation of economic facts without relating them to some problem usually requires a captive audience. It is an appropriate approach for the economist but not very appealing or effective.

Approach II

The presentation of a position supported by sorting and assembling facts that justify the position. Individuals and organizations trying to shape public opinion and arouse support for a certain cause use this approach. It is used mostly by groups who have already determined their positions. Those groups either for or against the Brannan Plan are examples. Pressure organizations consistently use it. I do not see this approach as an appropriate method in the educational field, although it may be effective and is often used by individuals who travel under the label of educators.

Approach III

The analysis and evaluation of a public problem based on certain unstated but assumed assumptions and criteria. Many economists make certain assumptions and then in the light of these unstated assumptions make an economic analysis. In the light of these unstated assumptions they may come to a conclusion that certain policies are good or bad. This is the position of the elder statesman and it is appropriate for certain individuals to take this position. The difficulty with this approach is that different economists come out with different answers, not because they differ in their economic analyses, but because they start out with different assumptions and value judgments. If too many economists do this, it discredits the profession. In the early stages of a movement before the question has become a serious policy issue, there appears to be more justification for this method by educators. The approach may be temporarily effective, for major policy issues, but its appropriateness for general use by all research and extension economists appears questionable.

Approach IV

The setting up of assumptions and criteria and the analysis of policies in the light of these assumptions and criteria. This is a scientific approach and works best among scientific groups when the analysis is to be presented in writing. It is the approach usually employed in teaching economic theory. Emphasis is not on whether the assumptions or criteria are correct but whether the economic logic is true. It is subject to some limitations when used at public meetings because values vary among individuals, and therefore assumptions vary. Confusion often arises because a portion of the assumptions are not accepted by the group for the purposes of analysis; therefore, the entire analysis is rejected. This is particularly true for nonscientific groups not trained in the scientific approach. This procedure is appropriate and has its place in research. As an educational approach with farmers it has definite limitations for the reason just given.

Approach V

The presentation of the problem and the alternative solutions and their implications, leaving to the public the job of appraising the policies in the light of their own values and criteria. More attention is given to this approach because it appears to me to be the most appropriate approach although least understood outside the extension economist's field.

Step number one is to start with the problem. What is the situation that needs to be corrected? Why is it a problem? Will its magnitude and acuteness increase or decrease? Why should the audience or reader be concerned? How will it affect him? These are questions that need to be answered in the first step, unless the problem is fully recognized by the group involved. If they are already acutely aware of the problem and its effect upon them, then less time will need to be taken to clarify the problem and show its relationship to their everyday lives. But let us remember that one of the basic concepts of learning is that only as the learner perceives the connection between what he is learning and the ways that he can use that learning in his life will the learning become a part of his behavior.

Some individuals might include here an analysis of the objectives of current legislation, if there is legislation dealing with the problem. I see no particular objection to doing this except for the time that it takes and the inability for anyone to interpret clearly the real objectives of most legislation. The more important question is what is the problem that is to be solved.

Step number two is to set forth all the significant and recognized alternative solutions to the problem. This is a difficult task, but unless a

framework is constructed broad enough to include all of the alternatives that may be supported by someone, the educator will be in trouble. This will be particularly true if the subject is of intense interest to the group.

Step number three is to analyze insofar as possible the probable economic consequences of each of the significant alternatives. Some may prefer to call this estimating the consequences of each of the alternatives. Attention may also collect to the major value involved.

This procedure allows the educator to contribute the most important information in the beliefs area without extending himself into the values area.

Step number four is providing for a situation in which the learners may combine their values with the beliefs presented and express their judgments. This can be done at meetings where the audience is broken up into groups of ten to twenty individuals. These groups may then, through the discussion process, combine their values with the facts and concepts presented and together arrive at their individual and group judgments. This approach allows the economist to make his contribution in the area where he is qualified and the people to make theirs in the area in which they are the only ones capable in a democracy. If these individual groups are then brought back together, each individual attending the meeting may see how the group appraises the question. The economist at this stage may or may not give his judgments or opinions. If he does, they should be clearly labeled and he should make it known that he is going beyond the field of economics and including his personal values. Meetings at which the audience or the speaker does not give their judgments sometimes leaves those in attendance with a feeling of frustration.

If information concerning a public problem is being disseminated by the other means of communication, the same procedure may be followed as has been outlined. However, in such cases no opportunity is provided for the readers as a group to include their values. The economist may stop with *step three* or in some cases some appraisal may be made by setting up certain criteria. Economists in the three states of Idaho, Oregon and Washington have recently released a publication entitled "Which Wheat Program" that is an excellent example of this approach.[4] They stop with *step three.*

Approach V Illustrated

Let us now turn to an illustration of the problem-alternatives-consequences approach. A farm leader says, "What about the old age and

[4] *Which Wheat Program,* Pacific Northwest Bulletin No. 11 (published cooperatively by the Extension Services and Experiment Stations of Oregon State College, University of Idaho, and State College of Washington), January, 1955.

survivorship program? Should we be for or against it? Will you come out and analyze it at our meeting?" Under this approach you would first set up what the problem is. The real problem is *how to provide a living for old persons and for dependent children who have insufficient resources or incomes of their own.*

The second phase is to set up the alternatives. They are as follows: (1) charity, (2) general taxation and relief, (3) compulsory insurance and (4) some combination of these three.

Next you would discuss the probable consequences of these various solutions. Most individuals are not particularly strong for charity, for taxation and relief or for compulsory insurance. The real problem is—which does he object to least in solving an acknowledged problem. By setting up the problem and the alternatives you immediately cast the question of analyzing the old age and survivorship problem in a different but more realistic light. You can only judge a particular program in the light of what the other possibilities are.

The situation is similar to one in which a friend of mine said that the doctor advised him to have an operation that he did not want to have until the doctor told him what the alternative would be, which in this case was that he might die.

Other Considerations

If the problem-alternatives-consequences approach is the more effective way of conducting agricultural policy education, then it should have a direct bearing on the approach used in policy research. In order for research to better serve those engaged in policy education, I should like to make the following suggestions: (1) that more attention be given to timing so that research information relative to a particular problem will be available when the problem becomes a public issue, (2) that more research projects be guided by what is needed to appraise the probable consequences of various courses of action in solving selected problems, (3) that the research be directed at the critical points where information is most needed for appraising the consequences, and (4) that more new alternative solutions to problems be developed and appraised. To study all the historical relationships and then to say, "What is there in this study that can be useful in policy?" is a wasteful use of resources. A reasonable amount of historical analysis is necessary, but more research should be made with an eye to its contribution to future policy decisions.

Adults are as eager to learn as children, but they do not have as much time. They do have more knowledge and experience upon which to draw. Therefore, materials must be brief and to the point. The educator must know his groups and the facts and concepts with which they are familiar

so that the time will not be spent in going over obvious and accepted facts. The time must be devoted to those beliefs over which there is controversy. Where data are available to clarify the situation at these points of controversy, it is well to have these data available in a form that can be quickly understood. This is much better than having the economist summarize the data and present the conclusions in a statement. Where the data are shown they may be discussed objectively and observed just the same as a demonstration may be given from an experiment station plot showing different crop varieties. It keeps the approach impersonal and objective. People learn by discovering relationships themselves more effectively than being told them. The source of the data should be given so that its validity may be easily checked by any doubting Thomas.

Timing the selection of issues is particularly important. Issues must be selected in which there is interest, but education should not be delayed until the public is making the decision by ballot or otherwise. The iron must be warm enough to be malleable, but not at the white heat stage where a misdirected blow may ruin it.

Although it is important to cooperate with all organizations in policy work, it is important that direct channels of education be kept open to the people. There are the two distinct functions in policy: (1) decision making and (2) action to get the decision carried out. Education can make the major contribution in the decision making area. It is largely the function of pressure organizations to rally the people around certain policies and obtain action after the policy decision has been made.

Educational groups should avoid passing resolutions, or taking action as a group, that would be stepping over into the field of the pressure organizations. If these two functions are not kept separate the educational function will be jeopardized. Sometimes there will be general agreement at meetings concerning a particular problem. Some people in their enthusiasm will propose the passing of resolutions and taking action to bring about their judgments. This action should be carried out by the regularly instituted groups and not by the educational group. If no group is available that has interest in the particular area, then another group should be formed independently of the educational one to carry on the desired action.

The discussion and presentation must be put in layman's language if the specialist's contributions are to be effective. One of the principles of education is that each idea and relationship must be within the learner's ability to perceive at his stage of development. The technical jargon that the professional economists use to talk with each other many times is as out of place at a farm policy meeting as a woman in an evening gown at a picnic. Laymen do much reasoning in the economic field without using

the technical terminology of the economist. The economist's job is to understand their terminology and not insist that they use his. The illustrations must be drawn from their lives and experiences and not from those of the economist.

Summary

In increasing understanding of public problems and policies the first task is to recognize the part that beliefs and values each play in making judgments. Next is to select the most appropriate approach that will allow the economist to make his contributions as an economist and the farmers to make theirs as citizens in a democracy. The problem-alternatives-consequences approach, whether used at meetings or through the written word, over TV, or radio, I believe, offers the approach upon which more reliance should be placed. This approach should then be coupled with the normally accepted principles of learning. A movement of policy research and education in this direction will increase the scientific and professional standing of agricultural economists by casting them in the policy role they are most capable of performing. In policy formation the economist educator should always be on tap but never on top.

METHODOLOGICAL PROBLEMS IN AGRICULTURAL POLICY RESEARCH

G. E. Brandow
The Pennsylvania State University

A POLICY problem may be said to exist when there is an unsatisfactory state of affairs, the correction of which seems to require group action. Our interest today is in agricultural policy, and in order to be reasonably specific I have written this paper mainly with agricultural price and income policy in mind. In most respects, this area provides an example of the approaches used, difficulties encountered, and conclusiveness of results in policy research.

Viewed from the standpoint of research, many "complete" policy problems have a common structure of subproblems. The main problem exists because the real situation departs materially from some desired state of affairs. Any of several alternative courses of action might be taken, but the best cannot be chosen until the consequences of each alternative have been studied. An analysis of any single course of action turns out to require investigation of numerous subproblems that constitute parts of the whole. The central problem requires solution of increasingly restricted subproblems as one attempts to come to grips with it for research purposes.

An example may make this clearer. We have had a wheat problem in recent years. What ought our wheat policy to be? The several alternative ways of dealing with the wheat problem include stringent production controls, multiple-price plans, compensatory payments to growers, and complete return to the open market. Which is best? To answer this, we need to know the consequences of each alternative. But in order to describe how a compensatory price program, for instance, would work, we need to know how wheat production would respond to various realized prices, how exports and domestic uses for food and feed would be affected by different market prices, how acceptable farmers would consider direct payments to be, and the like.

Thus the original, broad problem leads to numerous more limited questions in farm management, marketing, price analysis, sociology, and related fields. There develops a hierarchy of problems for research, with the single, complete question at the top, a few broad questions about the consequences of alternative courses of action coming next, and a base of numerous specific questions about facts and relationships in several fields of study.

In discussing research methodology, it is convenient to start at the bottom of the hierarchy and to work up. For want of suitable descriptive

terms, I shall refer to the limited research problems at the base as problems of the third order. Questions having to do with consequences of courses of action are problems of the second order, and the choice of the best of several alternatives is a problem of the first order.

Problems of the Third Order

Interest in a broad policy problem may lead an agricultural economist to do research on beef cattle as a farm enterprise in western Kansas. Is this policy research or farm management research? The same interest in policy may lead to a study of the elasticity of demand for beef. Is this policy research or price analysis? The motivation for each is a concern about policy, but the research methodology in the first case is drawn from farm management and in the second, from price analysis.

I am not really interested in debating whether this is policy research or some other kind; my point is that research on problems of the third order almost always uses methodology in some area of study such as farm management, price analysis, or marketing. By and large, the men best qualified to do research of this sort are the men trained in those fields. Methodological problems are fairly well recognized, and I shall only try to make a few comments from the standpoint of policy.

Farm management. In farm management, questions prompted by an interest in policy often ask what the income-maximizing position for a type of farm would be under certain assumed circumstances. Frequently the answer cannot be found by observing adjustments made on actual farms, because the assumed circumstances have not existed. Recourse must be had to a synthesized solution. Thus, construction of "typical farms" representing various important situations in which farmers find themselves is particularly valuable. Farm budgeting or linear programming can be used to work out solutions for the representative farms. It is essential, of course, that the data used in this work be based upon accurate, detailed knowledge of farm resources, performance rates, and the like.

A common need in the same area is for input-output relationships. These, too, are very useful in answering the "What would happen if . . ." sort of question. Another frequent problem is that of understanding the effects of changing technology on the amount and kinds of farm production, on the flexibility of individual farm operations, and on the demand for land, labor and capital in agriculture. Here, as in most areas, methodology for dealing with dynamic problems appears less well developed than that for analyzing essentially static situations.

Price analysis. Price analysis is an area often involved in policy problems, and methodological problems are numerous and challenging. Since one session of these meetings is devoted to demand analysis and another

to supply analysis, however, I shall only comment upon the adequacy of price analysis for policy research.

Price analysis has greatly increased our understanding of the structure of markets, has produced many useful estimates of particular demand and supply elasticities, and has amplified and reinforced much of the theory of price. In these ways, it has materially reduced the uncertainty that would otherwise exist about the nature of price problems and the consequences of various programs for attacking them. Yet, price analysis has failed to provide results adequate to the needs of much policy research. Sometimes a model used in price analysis has not been designed to estimate structural relations required in answering policy questions. Or methodological difficulties and lack of data together have caused the model to be limited to fewer variables than the policy problem requires to be considered. But most common and troublesome is the lack of precision of numerical results. Often different analysts have arrived at materially different estimates of the same thing, or the same analyst has obtained different results from different methods, or individual estimates have had large standard errors. In the extreme but not uncommon case, numerical results are entirely lacking.

This state of affairs is much less a reflection on price analysts than the result of the formidable methodological problems involved in trying to infer economic relations among data generated during the course of past economic events. Since we are unlikely to be able to substitute controlled experiments, deficiencies of this type, though probably not of this degree, will plague policy research for a long time.

Descriptive statistics. Comments like the foregoing could be made about policy-prompted research in marketing, land economics, credit, and other subfields of agricultural economics. In general, the methodological difficulties would be seen to be well recognized ones in those areas rather than being peculiar to policy. A comment about descriptive statistics, however, may be in order.

Mere description has been severely criticized at times, and often properly so. Yet much policy research would be impossible without the vast accumulation of statistics of crop and livestock production, prices received and paid by farmers, and numerous other series such as emanate from U.S.D.A. Also invaluable are indexes of production and prices, estimates of marketing margins, and similar statistics prepared from the basic data. As policy research and other uses increase, the statistics need to be refined and extended. Gross and net income estimates for major economic classes of farms would be especially useful in interpreting the farm income situation.

Noneconomic areas. Most broad policy problems involve subproblems

outside the field of agricultural economics. Peoples' attitudes, beliefs and valuations underlie their objectives for policy and greatly influence the workability of any proposed line of action. The political process usually is involved in the making of policy decisions and in carrying them out. Thus problems of the third order are found in sociology, political science and other allied social sciences. Again, the methodology used in policy-prompted research in these fields is the methodology of the special areas.

Problems of the Second Order

Policy problems of the second order have to do with alternative courses of action and their consequences. As has been indicated earlier, a principal task for research is to trace through the results of alternative ways of dealing with the central policy problem. But a difficulty of limiting the scope of research to this alone is that it passes over the question of how the available alternatives become known. Hence, research on this order of policy problem includes both the development of alternative courses of action and the analysis of their consequences.

Few generalizations seem possible about the methodology of developing alternative courses of action. Primarily the methodology consists of the working of the human imagination against a background of knowledge about the existing situation, the ideal situation, and the economic, political, social and technological facts and principles controlling possible solutions. A keen interest in finding a solution to the main problem is essential, and so is knowledge of the existing situation and the possibilities inherent in it. Perhaps the most important thing that can be said from the methodological standpoint is that inspiration alone is not sufficient; it must be tested by an examination of administrative feasibility and of economic consequences.

The implication to this point that alternative courses of action are clearly distinguished from each other also needs modification. Often some or all of the alternatives merge into each other. In these cases, a first methodological problem is to identify a limited number of alternatives that typify the principal possibilities and will be enlightening to those who will use the results of the research.

This takes us to the main task of second order policy problems: tracing out the consequences of alternative lines of action. Certainly there is a logical approach to such a task, but I doubt that there is or can be any cook-book style methodology to guide the research worker. If he is well trained in economic theory and familiar with the workings of that area of reality in which the problem has its setting, he will be able systematically to think through in a qualitative way the consequences that are likely to flow from a certain policy and the significant elements of the

existing situation that are likely to be changed. He then constructs, more or less formally, an analytical system—a model—that gives place to the important data and structural relations involved in establishing a new equilibrium under the proposed policy. Systematic analysts are likely to specify the model in detail, while those adopting a more intuitive approach may merely glimpse it in their imaginations.

The next step is to make the model quantitative. Data describing the existing situation are inserted. Empirically derived relations specifying how the elements of the model interact on each other are adopted. Any relevant principles of political behavior (seldom capable of quantitative expression) are specifically described. Then the changes that the contemplated course of action consists of are made, and their effects on other elements are studied by tracing through structural relations and the implications of principles of social and political behavior. The new situation that develops from the proposed course of action can then be described and contrasted with the old. If desired, estimates of the sequence of events and the time necessary to achieve the transition from the old to the new may be attempted.

But such an analysis often is beset with difficulties that make the foregoing description woefully inadequate. Some of the major difficulties, which tend to merge into each other, are these:

1. Theoretical formulation of the problem may be difficult. Abstract general theory must be elaborated and made more specific as a particular area of economic reality comes under investigation. The researcher may need to integrate theory about the behavior of farms or other firms with theory about the behavior of aggregates, or he may require new theory with which to approach a dynamic problem. Here, as in much applied work, original contributions to general theory can be made.

2. Construction of the model involves more than the theoretical formulation of the problem because the model must be a workable compromise between the theoretically ideal and the practically possible. Theory and possibilities of getting data are considered simultaneously. Any necessary simplification of the model may be achieved by such devices as ignoring peripheral effects and lumping together closely related but somewhat dissimilar factors into aggregates. Frequently a model is found too ambitious after considerable work with it and is replaced by a cruder, less satisfying, but more feasible substitute.

3. Lack of appropriate and reliable data for the model usually is the principal limitation on research on second order policy problems. Deficiencies found in the area of price analysis have already been mentioned. Discouragingly often, the needed third order analyses have not been

made, or, if made, were done for another purpose and do not quite fill the bill.

An important but different limitation is that the record of the past sometimes does not contain the experience necessary to provide a desired answer. Suppose we need to know how much of a particular crop would be produced at certain alternative prices that might be assured to growers over a period of years. Even if a supply function were available from an analysis of historical data, it would show only how output varied in response to *annual* price changes under conditions of price uncertainty. The available piece of research, though having the superficial appearance of being satisfactory for the purpose, would be useful only as a limiting case.

Sometimes there is more than one way of getting at a desired piece of information. If a suitable supply schedule is not available, for example, the researcher may turn to an analysis of the comparative advantage of the product on farms of different types at various prices. This is likely to be difficult and far from satisfactory, but the second-best choice may be better than none.

4. The necessity of making judgments in setting up models and in selecting data for them introduces uncertainty into the results. The judgment required here is scientific judgment about what the facts and relationships *are* rather than value judgments about what they or the outcome of the analysis *should be*.

5. Since choices must be made and judgment exercised, evaluation of the reliability of second order policy analysis is highly important. Generally, usual statistical tests of significance are of no direct help. One useful procedure is to work out the results using different approximations at critical points in the analysis. Sometimes the answer to a given question turns out to be the same over a wide range of reasonable assumptions. But, unfortunately, the evaluation itself often can be only an impression gained from the "tightness" or "looseness" of the theory and data used.

6. G. S. Shepherd, in the May 1955 issue of the *Journal of Farm Economics*, raised some interesting questions about the role of preconceptions in influencing conclusions. Methodology of research on many third order problems is good enough that conscientious and capable analysts will arrive at essentially the same results. But methodology for problems of the second order is weaker, less dominant. When the analytical model is not theoretically complete or is not strongly fortified with accurately estimated data, it is only realistic to recognize that the judgment involved, which is properly scientific judgment, can be colored by value judgments.

Some individuals probably succeed better than others in insulating

scientific from value judgments. The possibility that preconceptions may at times produce "research" results that reinforce the preconceptions must be faced and evaluated if analysis of second order policy problems is to be made as scientific as possible.

Before leaving research on second order problems, I need to mention another kind of analysis: the study of how a government program used in the past has worked out. Data on events that occurred under the program usually will be relatively easy to obtain. But often influences other than the program were also at work and caused modifications in the situation. How are the effects of the program to be isolated from effects induced by other causes? Furthermore, an illuminating analysis is likely to require comparison of results under the program with results under one or more alternative policies. Although research on a program actually experienced ordinarily can be more conclusive than research on a proposed course of action, the analyst often becomes involved in some of the methodological problems I have just discussed.

Problems of the First Order

Here a decision is to be made as to the best of several possible alternatives for dealing with a problematic situation. If there is no dispute as to objectives and if means of attaining objectives do not conflict, a single choice may be clearly indicated. But such situations seldom remain problems for long. Usually we are faced with conflicting objectives held with varying degrees of intensity by different persons. Value judgments, out of place in second order policy problems, are at the center of first order problems. Research methodology, usually decisive in third order policy problems but less so for those of the second order, plays a very limited role in first order decision making.

Yet there are ways in which a research approach can contribute even here. Must we, for one thing, take the position that it is fruitless to do research on what our specific objectives ought to be? I suggest that most Americans share certain fundamental goals such as individual freedom, equitable sharing of society's production, and the like; that these broad goals are difficult to make specific in terms of events of the day; and that much of the disagreement and squabbling is about the specific, immediate objectives that are thought consistent with fundamental goals. Isn't it possible that research by social scientists can at least narrow the range of disagreement? I raise the question without being prepared to show how it might be done.

So far, I have ignored the question of who decides that a situation is unsatisfactory and therefore problematic. Individuals and groups have their own particular orientations toward situations and, accordingly, their

own perceptions of problems. If an individual or group finds some situation unsatisfactory and urges public action as a remedy, objective description of the nature and scope of the difficulty can assist society in deciding how significant the problem really is. Descriptive statistics of the kind mentioned earlier are helpful for this purpose.

Economic analysis also plays a role in obtaining public recognition of certain important policy problems. The economist, aware of society's basic goals and understanding the operation of the economic system, may urge recognition of immediate, specific objectives that individuals or groups otherwise would neglect. Economists' emphasis on economic efficiency in its broadest sense seems a case in point. Self-interest of individuals and organized groups is not likely to excite much interest in economic efficiency except as it shows up in the firm, yet it is highly important to the common, basic goal of a higher level of living.

Despite such contributions, however, research and economic analysis are seldom decisive in answering the central question: what ought to be done? Value judgments are too important and too difficult to handle satisfactorily with any available methodology. I do think, however, that it is desirable for some persons doing policy research to arrive at conclusions as to what should be done and to put these views before the public. Such conclusions help to provide rational focal points for public discussion and lead to better policy making in the long run.

Concluding Comments

Though this paper may have paid too much attention to price and income policy, the general ideas apply to most agricultural policy research. Study of a soil conservation policy question, for example, will lead to numerous third order policy problems, though in a somewhat different combination of areas than I have mentioned for price policy. Research on some second order problems may find largely mathematical models less appropriate than I have implied for price policy, but some analytical system will have to be created and studied. Practically without exception, research can make some contribution to solving first order policy problems but cannot be wholly decisive.

All established subfields of agricultural economics have a large policy content, for third order problems are at the base of all complete policy questions. It would be highly unfortunate if an impression became common that only specialists in policy should do research having policy implications. Even research projects undertaken for an entirely different reason may have important policy uses, and the research is likely to be more fruitful if this is recognized as the study is designed and the data are analyzed.

The scope and variety of research that must be done to analyze most complete policy problems in a thorough manner is tremendous. Usually one or a few men cannot hope to do it all. Some form of cooperation is essential, and developing more cooperation, of either a formal or informal sort, is an important need of policy research.

The unavoidable lack of precision of results of much research on second order problems requires that both those who do research and those who interpret it should carefully discriminate between results that are solidly based on theory and valid empirical evidence and those that are less well founded. The critical comparison to make is between the accuracy required to answer the question at issue and the reliability the analysis appears to provide.

The distinctions I have made among types of problems and degrees of reliability were developed from research considerations. Yet they seem useful to the better integration of research and extension, for they display research results in a manner permitting the extension worker to make the selections he requires for his educational purposes. Progress in research requires experimentation with methodology and approaches, and results may be tenuous. Extension workers must decide when a result is adequate for a particular educational need. Hence they must understand research, be neither misled nor repelled by displays of methodological technique, and be prepared to integrate research results from a wide range of sources into their educational work.

DISCUSSION: INCREASING FARMERS' UNDERSTANDING OF PUBLIC PROBLEMS AND POLICIES

RAYMOND J. PENN AND PETER DORNER
University of Wisconsin

"Agricultural Policy" is one of the rapidly expanding fields of agricultural economics. In the 1920's we considered national price policy its main ingredient. Today that subject is at least as important as it was then. Yet it does not dominate the field as it once did. Actually policy has application to the individual farm firm. A farmer has production policies behind his production programs. He has policies with respect to his family's living and education. If policy has any meaning it is the desire and will of people to act on a problem confronting them. On the individual farms, agricultural research and extension has long been active in the area of policy decisions.

The expanding array of problems which we usually place in agricultural policy are those that require group action for solution. Included are such varied areas as county zoning, state fiscal policy, state aids to local units of government, national price programs, land and water development programs, social security, and even international affairs.

Increased emphasis on agricultural policy may foreshadow some real work

by agricultural economists on this matter of group action. The principles and motivating forces of group action are found in an intimate understanding of the problems and people involved, and are much broader than the field in which so many agricultural economists have recently been devoting so much of their time: refinements of the economic theory of the firm.

We find ourselves in substantial agreement with Mr. Bottum's paper and also with the policy extension program underway at Purdue. It should be re-emphasized that the final judgment on a policy question does not rest with the agricultural economist. Rather, it is his job to define the issues in a situation and describe alternatives and their consequences. The economist is in real trouble when he insists that his answer to a policy question is the only "right" answer. Group action requires compromising the judgments of the persons involved (both in and out of agriculture), including those of technicians and public officials.

Mr. Bottum seems to imply that the agricultural economics extension specialist can define issues, describe alternatives and appraise consequences in a completely objective manner without making value judgments. Research or extension without value judgments is particularly sterile for policy questions. The economist must make value judgments in selecting the alternatives for presentation and the consequences expected to ensue from acting upon these alternatives. Although these are value judgments they do not necessarily mean the economist is to inject his own opinions as to the most desirable course to be taken by the group. The procedures necessary to achieve certain consequences and the desirableness of these procedures and expected consequences should be judged only by the group—not the researcher or the teacher.

Furthermore, Mr. Bottum strongly implies that people's "values" are fixed and all judgments therefore are made to harmonize with these previously held values. It is not, it seems to us, a combining of their previously held values with the new beliefs or facts presented, but rather, it has allowed the individuals to form and reconstruct a new set of values. This is, as we constantly experience when we learn something new, the jist of education. If this does not occur, problems and conflict simply cannot be alleviated.

Mr. Bottum's second approach (the economist presenting a position and then finding supporting evidence) is a legitimate scientific method so long as the research worker or the educator is willing to describe the position as an hypothesis to be tested and accept contrary ideas and evidence with an open mind. And the line between this and his fifth and recommended approach (presentation of issues, alternatives, consequences) is not as conveniently antiseptic as we might wish.

Another idea that should be challenged is the belief that farmers (or anyone else for that matter) must choose between freedom and opportunity on the one hand and security on the other. This idea, although loosely held and widely discussed, is not supported by the evidence. John R. Commons formulated a much more realistic idea concerning group action—namely, that a rule restricting an individual's action may be the most important factor in expanding his opportunity and freedom. The choice may be between "security *and* freedom" or "*no* security and *no* freedom."

Now for two ideas not included in Mr. Bottum's paper:

The first idea is that the role of the educator goes beyond simply comparing the obvious alternatives. It includes the creative function of developing new

alternatives and arousing an interest to consider them. Seaman Knapp with his extension demonstration was presenting farmers with another alternative beyond those they had previously recognized. His process of education aimed at raising the level of understanding, thus creating a willingness to include the subject of the demonstration as a new and acceptable alternative for consideration. The teacher's job is selecting alternatives and consequences for presentation, but, in addition, it is the presentation of ideas (theoretical principles) that guided him in his selections. Only in this way can the group understand how it is that these are real alternatives. This will also permit them to think more fruitfully on their own when future problem situations arise. And education is certainly incomplete if this has not occurred.

The current emphasis of the agricultural economist—both research and extension—upon presenting alternatives may well include this function. If a certain kind or amount of education is needed to enable farmers to choose wisely among alternatives, then we need to recognize this too in our policy programs. This must be done with considerable caution for, unless we carefully follow an educational process in expanding the understanding of and desire to consider new alternatives, we will certainly bring extension under criticism, as has sometimes been the case in the past, for deciding what is good for farmers and telling them to do it.

The second idea, although implicit in parts of Mr. Bottum's paper, is that farmers, like others, are most receptive to information when they are faced with a decision. There is plenty of evidence on this point. Interest of Wisconsin farmers in national price support programs was almost double in 1954 (an election year) what it has been in 1955. In a summer when hay crops came on fast and haying weather was poor, Wisconsin farmers snapped up 50,000 copies of a grass silage circular which previously had aroused only moderate interest. The importance of such examples is that agricultural policy extension will probably make its greatest contribution with specific groups (and individuals as a part of those groups) who are contemplating some action.

We need extension and research "approaches" for working effectively with such groups on policy matters. How do we work with cooperative groups who are forming a butter selling agency? Farm organizations on price policy issues? County Boards of Supervisors on forest management issues? State natural resources commissions and other state and federal agencies on issues of concern to agriculture?

The "approaches" must, of course, be patterned to fit different situations, and we will not detail them here. However, educators have demonstrated that they can work in this area. One thing an educator needs is a desire to understand the problems of the group and to make his ideas and materials available in the genuine hope that group action will be benefited. Another is a willingness to be of service, within the scope of his competence, to all groups that are acting on matters important to agriculture. He need not accept the value judgments of the group to be of service to it. Nor need he feel that they should accept his. Groups do not want agreeable technicians except for advertising programs. They want teachers with ideas and information on what to do about their problems.

DISCUSSION: METHODOLOGICAL PROBLEMS IN AGRICULTURAL POLICY RESEARCH

ROBERT W. RUDD
University of Kentucky

In casting about for a handle by which to grasp the topic of methodology as it applies to agricultural policy research, Dr. Brandow, like Neptune, has come up from the sea bearing a three-pronged spear, or trident with which to attack methodological problems in agricultural policy research. He suggests that research problems in policy be arrayed in three orders. First order problems deal with the choice of the best of several alternative solutions to a policy question. Second order problems deal with the consequences of alternative courses of action with respect to agricultural policy, while third order problems deal primarily with questions of facts and relationships ancillary to policy questions.

I have some difficulty in viewing this particular trident as a weapon with which to pursue methodological problems in agricultural policy research. Why? There are two basic reasons. First of all, I would argue that the element upon which Brandow's division of policy problems into orders must stand is one of *scope* rather than *method*. As Dr. Brandow points out, this hierarchy of policy questions moves from "the single complete question at the top, [through] a few broad questions about the consequences of alternative courses of action . . . [to] a base of numerous specific questions about facts and relationships in several fields of study." These are primarily separations according to scope of problem. Even if we waive the objection that this division of policy problems into three categories is based upon scope, it is difficult to see the basis for separation of questions of the choice of the best among several alternative courses of action from an appraisal of the consequences of the alternative courses of action. If a decision as to what is "best" is to be made with respect to policy alternatives, this choice can be made only after the consequences of different alternative courses of action have been appraised. In turn, the choice of alternatives and their consequences calls for facts and relationships. Without such facts and relationships no evaluation of the consequences of courses of action could be made. These observations lead to the opinion of the relative inseparability of policy problems on this basis for purposes of appraisal of method.

My second point is that scientific method in research applied to any problem involves a specific sequence of elements regardless of the problem's position in any hierarchy of problems. Since Dr. Brandow has recognized the interrelation of these three orders of problems, one can conclude that the separation stands on difference in method applied to problems at the three levels. Scientific method usually requires, in addition to a sensing of the existence of a problem situation, the formulation of hypotheses about the problem and its solution, the collection of data for the testing of these hypotheses and the application of logic and statistical analysis to the data and hypotheses to arrive at conclusions that will support or cast doubt upon the hypotheses. It is evident that in any one of the three orders of problems the methodology is substantially identical as far as the basic elements of method are concerned. Even in the third order problem of arriving at answers to questions of facts and relationships, these same steps are necessary. The tools employed and the theory applied are those

of the particular discipline in which the problems fall. Whether this be psychology, farm management, or sociology, the basic method remains the same. The testing of hypotheses about the solution to policy problems is needed regardless of whether or not empirical measurements are used or logic alone becomes the basis for appraisal.

One of the most basic problems in methodology as it relates to agricultural policy research at this stage of development lies in the area of the assumptions with respect to what immediate objectives farm people want, which circumscribes much of the effort in farm policy research.[1] These assumptions, whether subjective or objective, become the fundamental criteria against which the forecast or recorded performance of policy alternatives are weighed. In many instances these objectives originate more nearly with the investigator than with the group that the policy problem concerns. This is at once a problem in the application of scientific method in the acceptance of unconfirmed assumptions, and a problem area for research in agricultural policy to determine the particular policy objectives of farm people. Further, in view of the changing character of our society, this is an area for continuing study.

Dale Hathaway, in an award-winning paper in *This Journal* two years ago, pointed to the need for a concrete appraisal of freedom as a farm policy objective. Hathaway also observed that decisions made by farm people on policy matters without a full awareness of the alternative income possibilities currently available among farm commodities may well be misleading if interpreted to indicate a preference among conflicting over-all objectives.[2] The same statement might be made relative to more immediate policy objectives of farm people. Both the validity of findings and the insights into policy issues would be vastly improved by objective identification of policy goals as held by farm people. This is not easy, however. Although agreement may be fairly widespread on ultimate objectives, such as freedom and the equitable distribution of the results of productive effort, I agree with Dr. Brandow that particular program objectives are probably subject to a rather wide variance of opinion among farm people.

What methods can be employed in policy research if this heterogeneity of opinion is known to exist? First of all, I would question the role of value judgement in eliminating this variance of opinion from the problem by selecting a single "best" set of objectives against which to appraise program alternatives, whenever other alternatives are available. I do not envision, as Brandow apparently does, the researcher being called upon to decide upon a single "best" answer to very broad policy questions. These are decisions customarily made in the democratic process collectively by those who are affected by such decisions. In retrospect, however, the researcher may have occasion to appraise the validity of such decisions. The question of what is "best" in terms of policy alternatives depends upon the set of values and beliefs held by the user of research results. The substantial heterogeneity of opinion among farm people with respect to immediate objectives makes necessary in many instances a statement of conclusions in multiple form, recognizing this variance in objec-

[1] Although reference is made here to the objectives of *farm* people, for many farm policy matters the entire voting electorate of the country is the group whose objectives would be assumed.

[2] Dale E. Hathaway, "Agricultural Policy and Farmers Freedom: A Suggested Framework," *Journal of Farm Economics*, November 1953, p. 509.

tives among the potential users of research results. Although this solution is not as satisfactory as a unique answer from the point of view of precision, it avoids the pitfalls of a single "best" solution if variance of opinion as to immediate objectives exists.

Another problem in methodology in agriculture policy research lies in the lack of adequate techniques for aggregation. Because policy decisions apply in many instances to a particular commodity and/or geographic area, much of our research has been conducted along such lines. We have studies of the peanut program, the wheat program, the dairy program and the tobacco program for example. Such studies are empirical in character and the results are couched in terms of quantitative estimates of effects. We also have several broad studies of policy that deal with aggregates; but these studies are in general terms and the results are qualitative in character. At present, we have not generally received methods for aggregating the results of these commodity studies to arrive at quantitative results for entire programs.[3] Can the commodity studies in policy be made more useful than mere guides in the formulation of aggregate studies of policy? This question is important in terms of method since it appears evident that commodity programs will be the order of the day in agriculture for some time to come. The commodity studies in policy already completed will not be the last, and any improvements in method that render these studies more useful in the appraisal of entire programs will be most worthwhile. Basic in such improvements, it seems to me, would be adequate recognition of the implications of competing and complementary crops or livestock in the individual commodity studies.

The foregoing comments have, I fear, placed too much emphasis upon the points in which I have disagreed with Dr. Brandow. Lest I leave this negative impression, I would like to add that the points of disagreement are relatively minor and I subscribe wholeheartedly to most of his comments.

---

[3] Since theory usually precedes method, it should be pointed out that there is no received general theory at this time that integrates micro and macro aspects of economics. See, for example, R. L. Clodius, "Needed Developments in Economic Theory for Use in Marketing," *Ibid.*, Proceedings Number, December 1954, pp. 1056-57.

DISCUSSION: INCREASING FARMERS' UNDERSTANDING OF PUBLIC PROBLEMS AND POLICIES AND METHODOLOGICAL PROBLEMS IN AGRICULTURAL POLICY RESEARCH

GEOFFREY SHEPHERD
Iowa State College

These are two excellent papers.

Carroll Bottum outlines several alternative approaches to increasing farmers' understanding of public problems and policies, and plumps for No. 5, "The presentation of the problem and the alternative solutions and their implications, leaving to the public the job of appraising the policies in the light of their own values and criteria." This he refers to later, for short, as the "problem-alternatives-consequences" approach.

This approach is in line with the generally accepted view that science can appraise means but not ends. People must appraise ends themselves, in the

light of their own value judgments, not in the light of the research man's value judgements.

George Brandow seems at one point to be going beyond this orthodox view, when he says near the end of his paper: "Value judgements, out of place in second order problems" (the study of the consequences of alternative courses of action) "are at the center of first order problems" (the choice of the best of several possible alternatives). "Research methodology, usually decisive in third order problems, but less so for those of the second order, plays a very limited role in first order decision making. Research and economic analysis are seldom decisive in answering the central question: What ought to be done?"

Brandow then raises the question whether or not we research men must take the position that "it is fruitless to do research on what our specific objectives ought to be." He cautiously suggests that research by social scientists may at least narrow the range of disagreement on goals. "Value judgements," he says, "are too important and too difficult to handle satisfactorily with any available methodology. I do think, however, that it is desirable for some persons doing policy research to arrive at conclusions as to what should be done and to put these views before the public."

If Brandow's suggestions were accepted, presumably the persons doing policy research would arrive at their conclusions as to what should be done on the basis of their own value judgements. Thus, Brandow appears to depart from the orthodox position stated by Bottum, who would keep the research man's own value judgements out of it. But then Brandow backs up. He ends up by saying "such conclusions help to provide national focal points for public discussion and lead to better policy making in the long run." The research man's conclusions based on his own value judgements as to what ought to be done are to be used simply as focal points for public discussion and determination of policy, not directly as the basis for policy.

Up to this point, I venture to think that there is substantial agreement, not only among these speakers and at least one of their discussants, but among agricultural economists generally, on what we may call the orthodox position that the speakers have so well expressed. That position can be summed up in a sentence: The research man should not let his own value judgements affect his conclusions. His job is to appraise price programs and policies, not by saying that they are good or bad or ought to be adopted, and not by saying what the objectives ought to be, but by showing the consequences of these and other programs, leaving the voters to choose among them on the basis of their own value judgements. I believe that there is general agreement up to this point.

But when an orthodox position becomes generally accepted, and consolidated, it is time to begin to push on beyond it. This pushing on beyond the orthodox position does not mean that the position is wrong; the position is correct enough; but we are ready now to go on further.

The direction in which I ask you to consider going now is this: We agree that a scientist can appraise means—not praise or condemn them as right or wrong—but appraise them by showing their consequences, and leaving the voters to choose among them. I believe now that we are ready to show that a scientist can appraise ends too, in just the same way that he can appraise means. He can show the consequences of alternative ends and value judgements concerning ends. He can show the consequences of attaining various objectives, in just the same way that he can show the consequences of alternative means.

I know that this view appears to differ from the views that have been expressed by a number of distinguished economists and other scientists. But I believe that close examination will show either that the difference is only apparent, or that I am simply proceeding further than they went.

Here are a few of these orthodox views:

"Economics cannot pronounce on the validity of ultimate judgements of value."[1]

"Economics deals with ascertainable facts; ethics with valuations and obligations. The two fields of inquiry are not on the same plane of discourse."[2]

"The sense of value that is the basis of choice and freedom lies in a realm that science does not touch . . . freedom in its most essential sense is something of the spirit, and . . . this something of the spirit is beyond the realm of science. . . ."[3]

And, of course, another way of putting it is to say "De gustibus non disputandem est." In everyday English, if I don't like spinach, that's all there is to it.

I think, however, that spinach actually illustrates the view that I am presenting rather than the orthodox view.

The orthodox view holds that if a scientist told me that I ought to eat spinach on some ethical or moral grounds, he would be out of his field, off the beam, out of his element. I agree with this view completely. But what I say is this: If a nutritionist (a scientist in the field of nutrition) told me that if I refused to eat spinach my teeth would fall out, but that if I ate spinach I would keep all my teeth—that is, if he told me the consequences of my value judgement concerning spinach—I would consider him absolutely on the beam, completely within his role as a scientist. I feel sure that Robbins *et al.* would also; they would admit that my value judgement *did* lie in the field of science. And I know that I would change my value judgement, because I have in fact already done so. I still don't like spinach, but of my own free will I do eat it.

This illustration, which I use here for clarity and brevity, means to me that values and value judgements are *not* outside the realm of science; they do lie on the same plane of discourse.

Note that this view agrees with the orthodox view that the scientist should keep his own ethical value judgements out of his work. But it disagrees with the orthodox view (although it really does not so much disagree as simply go on further) in that it says that science can appraise ends as well as means, objectives as well as programs, and ethics as well as other realms.

It can do this because any moralist or one concerned with ethics today has to answer the question—how do you know what we ought to do? What is the basis of your morals or ethics?

When the cultural anthropologist shows us the diversity of ethical systems existing at different times and among different cultures at the same time, one has to recognize the ethical systems and value judgments are not based on some assumed ethical order in the universe, but are subjective and relative to

---

[1] Lionel Robbins, *The Nature and Significance of Economic Science*, New York: MacMillan 1940, p. 147.

[2] *Ibid*, p. 148.

[3] A. H. Hampton, "Science and Human Freedom," *Symposium on Human Freedoms*, Coe College, Cedar Rapids, Iowa, 1952, p. 10, 5.

time and place and culture. That is, ethics is not born, but made—not discovered, but built.

And what is ethics built on?

It is built on the attainment of man's highest good. In less lofty terms, it is built on the fullest long run satisfaction of his fundamental wants. And ethics built on that basis lies right in the realm of science.

I do not expect you to accept these views now, expressed as they necessarily are in such brief compass. In order to carry more conviction, they require more complete development, which I have given them in an article submitted for publication in a forthcoming issue of the *Journal of Farm Economics*. If they stand up under scientific criticism, I believe they open up some new vistas for philosophical treatment and empirical test.

RELATIVE EFFICIENCIES OF ALTERNATIVE TENURE SYSTEMS

Chairman: Frank Miller, University of Missouri

A FRAMEWORK FOR ORIENTING RESEARCH IN LAND TENURE WITHIN THE EFFICIENCY CONCEPT

WALTER E. CHRYST
Production Economics Research Branch, ARS

THE purpose of this paper is to review the efficiency concept and to suggest a relevant framework within this concept for research in land tenure. In so doing, it is hoped that some background will be provided for the following papers of Drs. Ottoson and Toussaint dealing with research that is either underway or contemplated in the area of the tenure status of farm operators upon the organization, use and productivity of resources employed in agriculture. I shall deal with the principle of efficiency in broad terms, indicate some of the general problems involved in achieving efficiency, and speak of some characteristics of land and the tenure system that give rise to specific problems.

Importance of Efficiency in Agriculture

For the purposes of the conceptual analysis developed in this paper, it is suggested that the function of agriculture in the national economy is the production of food and fiber for domestic consumption and exchange in international commerce. By definition, if the resources used in the production of food and fiber are not organized in the most efficient manner the maximum amount of agricultural products will not be available. By addition, if agricultural resources are not organized efficiently the total quantity of goods and services available to satisfy the wants of the social group is less than the maximum possible by the difference of what is produced and what can be produced in agriculture. Hence, if the land, capital, and human energy used in agriculture are to make the greatest contribution to the basis of national welfare, it is imperative that these resources be used in optimum combinations.[1]

The argument has been advanced by some that as resources are not used efficiently in industry as a result of monopoly or monopolistic competition, efficiency in agriculture is not a valid objective. The justification for efficient use of resources in agriculture is independent of the level of efficiency with which any other segment of the economy is operated.

[1] Optimum, as used above, refers to the combination of factors that will result in the largest possible value of product from all factors that are voluntarily committed to the production process.

An industry or a segment of the economy disposing of its output in those markets where a larger volume of products yields a smaller amount of gross receipts will have its aggregate claims upon the total output of the economy reduced by virtue of a gain in efficiency, and to this extent the welfare of the workers in the segment is reduced, although the basis for the welfare of the society is enlarged. This market phenomenon does not invalidate the need for efficiency in agriculture from the societal point of view, but it does call attention to two additional problems that can be dealt with separately: (1) the problem of an interindustrial reallocation of resources, and (2) the problem of an interindustrial reallocation of income while the resource adjustments are being effected. These, however, are separate problems and fostering or condoning inefficiency of resource use offers nothing toward their solution.

In short, the best interests of society are served by producing the most from resources that are available, regardless of their current geographic and occupational distributions. If certain distributive problems result, these can be dealt with more expeditiously by taxation and by supplementation of individual incomes than through attempts to equate inefficiencies of resource use among industries.[2]

The Efficiency Criterion

The analytical framework of economic efficiency rests upon but one fundamental principle which has been stated succinctly by Professor Knight:

> Economic theory is concerned with the allocative aspects of economic behavior. Its entire argument comes under the single economic principle that a total result is maximized through allocating means among alternative channels of use (each subject to a law of diminishing effectiveness) in such a way that equal increments of means yield equal increments of end in all modes of use.[3]

This principle, which owes more to mathematics than to economics, encompasses a substantial part of human activity. It is applicable to any problem in which ends can be identified and ordered and where it

[2] Although this is the usual oath of renunciation of distribution problems, it is utilized here only (1) because space and time do not permit the elaboration necessary to explore the role of land in the welfare distribution context and (2) because a consistent argument can be developed from the production side without reference to the distributive aspects. Income may be used in a number of ways without experiencing a serious diminution in the total product of the economy. Among the numerous references to the role of land income in a redistributive mechanism are those contained in T. W. Schultz' *The Economic Organization of Agriculture*, New York: McGraw-Hill, 1953, pp. 126-7, Abba Lerner's *The Economics of Control*, New York: Macmillan, 1944, pp. 231-3; and Kenneth Boulding's *Economic Analysis*, New York: Harper Bros., pp. 240-41.

[3] Frank H. Knight, "Economic Science in Recent Discussion," *Amer. Econ. Rev.*, Vol. 24, 1934, p. 229. This will be recognized as the equimarginal principle.

is desirable to satisfy the ends as fully as possible. Many decisions of every individual—how and upon what he shall expand his energy, his time, his income, and the resources over which he has control—are within the scope of this single principle. Similarly, from the societal point of view, the principle is applicable to the allocations of resources among uses within firms, among firms, among industries, between public and private ends, between national security and current (and future) production for consumption.[4]

In agriculture, the area of economic activity to which this paper is confined, two basic allocations must be made. Resources must be distributed among products produced at the same point in time and among products produced at different points in time. To achieve these distributions, a third allocation is needed—an apportionment of the resources among the organizing units—or firms, in a capitalistic economy.[5] The fundamental principle is the same for all of these allocations. In the case of uses within firms, the output (and income) of the firm will be maximized when all of the resources are allocated in such a fashion that the return is the same for the last unit employed in each use.[6] With respect to the allocation over time, if a resource is of a nature such that its use may be deferred, income to its owner will be greatest when it is allocated among time periods so that at the margin, the resource will produce no more, in terms of current values, in one time period than in another.

The principle holds for allocation of resources among firms. Again,

---

[4] It is customary at this point to acknowledge the existence of other or "noneconomic" ends. Much of what has been cited as "nonecomonic" ends, in reality, has dealt with the evaluation of the relative merits of various ends and their changing character. If, however, any end, regardless of its classification, may be achieved through different means, at least one of which entails a different cost than others, independence from economics cannot be established. If other ends exist, these ends must bear one of three relationships to economic efficiency as an end-in-view to the ultimate end of maximizing total satisfaction. The ends may be independent, complementary or competitive. If the other ends are independent of the economic end, no problem of weighting exists. If the other ends are complementary with economic ends, then any action that will contribute to increased efficiency will, at the same time, contribute to attainment of the other end, and again the problem of determination of supremacy is not present. If, however, the end-in-view of efficiency is competitive with the other end, then decisions must be made (and these will be economic decisions) apportioning the available means among the different ends. Thus, in dealing with other ends, the end-in-view of economic efficiency will be considered of paramount importance unless it can be shown that the other ends can be achieved more expeditiously through the sacrifice of efficiency than through any other means.

[5] As the firm exists only as a means of combining resources in order to achieve production, it is not an end in itself and hence interfirm allocations are not basic allocations. Actually, as will be shown later, the firm may act as an obstacle to efficient resource use rather than a means of its attainment.

[6] In referring to the increment of output, the incremental physical product times its per unit market price is meant.

as with products and time periods, if a part of the resources used by one firm would yield a greater return if used by another firm, the consuming public will gain from the use of the resources by the other, more efficient firm. Resources will be distributed in an optimum manner among firms, from the public point of view, when no further transfers may be effected that will result in an increase in the total output.

Obstacles to the Fulfillment of the Efficiency Criterion

We have offered nothing new in the theory of resource allocation. The principle is simple—any economic problem must ultimately reduce to applications of the equimarginal principle. Yet a considerable amount of evidence has been assembled indicating that resources in American agriculture are used inefficiently.[7]

There are two fundamental reasons why the efficiency criterion may not be met. The first reason stems from the inability of those responsible for allocative decisions to acquire the data necessary to achieve a high degree of precision. Secondly, decisions must be made in an environment of law, customs, mores, and other institutions through which the group influences individual decisions. The first obstacle is essentially technical in nature in that identification and measurement are involved. The second is social in that we are concerned with the degree to which group decisions—frequently developed to overcome the first obstacle—result in economic achievements that are less than the maximum possible. Both obstacles are important and must be dealt with in every investigation concerned with the efficiency of use of all resources.

Inability to identify relevant means and ends

We shall consider first the obstacles directly associated with the equimarginal principle. The principle rests upon the ability ". . . to allocate equal increments of means among alternative channels of use . . . in such a way that equal increments of means yield equal increments of end in all modes of use." Obviously, two types of data are required to accomplish the required transformations subject to this condition: (1) ends must be identified with their means of achievement and (2) the rate with which means are transformed into ends must be ascertained. Through the application of prices the ends must be ordered in accordance with their ability to contribute to human satisfaction. Only with the knowledge of what each means will yield in each use, can costs, in terms of amounts that must be foregone, be determined.

---

[7] See particularly T. W. Schultz, *Production and Welfare in Agriculture*, New York: The Macmillan Co., 1950, Chapter 7.

Inability to effect appropriate measurements

The difficulties of determining the rate with which resources are transformed into returns are familiar to all who have conducted economic inquiries. We can say nothing about any phenomena that we are unable to measure, and only slightly more where we have knowledge only as to the direction of changes.[8] Precision in resource allocation, both from the standpoint of the individual and from the standpoint of public policy, must rest upon knowledge of the magnitudes of change. Fortunately, great strides have been made in mathematics in the last 20 years, particularly in the application of probability theory and in the development of computational techniques, and economics has profited accordingly.

The inability, however, to measure all forces bearing upon economic change means that predictions can never be precise; they are approximations and hence some errors are always present, and many of the statistical methods that work well in the physical sciences have restricted usage in intertemporal economic applications. The more powerful modern statistical techniques rest upon the assumption of normality of distributions and independence of successive observations—conditions that would be present in only a random economy.[9]

The inability to determine the relationship among all relevant variables precludes the establishment of complete knowledge. With complete knowledge, decisions could be made with complete accuracy and the optimum allocation of resources established. Without complete knowledge, however, decisions must be made in an environment of risk and uncertainty. The greater the lack of knowledge with respect to the consequences of any given arrangement of resources, the greater the chances of loss.

Decision makers, whether at the individual, firm or policy levels, react to this environment by adopting patterns of resource use that reduce the possibility of loss—the degree of reduction depending upon the nature of the uncertainty as viewed by the decision maker and his preferences with respect to income stability and income levels. As some stability of income is necessary for economic survival, and resources must be arranged to provide this stability, any difficulties of measurement or any phenomena that tend to increase risk and uncertainty must result in resources being used at a lower level of efficiency.

---

[8] See Richmond Stone, *The Role of Measurement in Economics*, Cambridge: The Cambridge University Press, 1951, pp. 1-24.

[9] Important but often neglected limitations of the applications of probability theory in economics are presented in Gerhard Tintner's *Econometrics*, New York: Wiley & Sons, 1952, pp. 185-188.

Tenure Oriented Obstacles to Production Efficiency

The tenure system has been defined as those relationships instituted among men to govern the distribution and transmittal of rights in land. In order to facilitate the division of labor for this segment of the program, we have attempted to distinguish between the tenure system and tenure arrangements, as these are commonly regarded. The division is roughly this: The system is considered the framework that permits the division of these rights in space, in time, or among individuals, thus dealing with spatial, intertemporal and interfirm allocations. Tenure arrangements in the main, involve the payment for these rights that the system permits, and hence are more concerned with intrafirm relationships.

Allocative norm

The relevant tenure objective within the efficiency concept, is a system of allocating rights in land in such a manner that these allocations will not result in a combination of the resources available that will yield less than the maximum product attainable. To achieve this maximization, rights in land or their transmission must not necessitate or encourage the apportionment of the landed resources among the various uses so that the last unit employed in any particular use will yield no more than in any other use. Secondly, the conditions of acquiring rights in land should not result in the employment of complementary resources in such a manner that the last unit of each resource does not yield the same return in each of its uses. If these conditions are met the landed resource will yield its maximum contribution to the basis of welfare.

Obstacles to achieving norm

As suggested before, the tenure system distributes rights in land among men or groups of men. These rights in land are measured with reference to a particular point in space and to a particular point in time. The land for which rights are conveyed or reserved is, in the American tenure system, identified with some definite area of the earth's surface and may include rights to all resources existing on, above and below the defined area, or any one of the six other combinations of rights that can be constructed by three items taken together, singularly or in pairs.

The separation of rights in land in time and the vesting of these rights in individuals whose use to these rights is limited to their lifetime imposes problems in associating costs and returns. The period for which income is to be maximized is of less duration for the individual than for the social group, and that which is required for maximization in a specified period is not always a partial requirement of that which is necessary for maximization through time. The total result is maximized when resources are

allocated to yield equal increments at the margin in each time period. The incentive to those who control rights in land to make investments that yield returns after these rights must be relinquished has long been questioned. Returns to outlays are always separated by some period of time and for those uses where the separation is longer than the expected duration of the rights in land that are the means of claiming these returns, investments will not be made at the income maximizing level for the group.[10] The difficulties entailed in getting resources allocated to slow-yielding enterprises of the conservation type, particularly on rented farms, are well known.

In summary, if the tenure system functions to effect a distribution of costs and returns in time and space for holders of rights in land that is different from the distribution of costs and returns in time and space for the social group, the institution of private property in land and functioning of the market mechanism cannot achieve the most efficient utilization of resources. Or, alternatively, the spatial and temporal allocation of rights in land among individuals has attached some cost to the public in terms of loss of real income.

The tenure system complicates the problem of measurement. The techniques used in firm analysis are not wholly sufficient to deal with the total problem, and to the extent that the tenure system results in a diffusion of costs and returns among firms, the total product of many firms may be diminished (to the point of extention in the case of flooding) as a result of efforts to increase products in other firms. The tenure system can magnify the consequences of natural phenomena and this magnification, from the problem of total resource allocation, properly is not an element of risk, and treatment as such is not adequate to insure optimum use of resources. The problem of tracing and identifying these costs and returns is of an appreciable magnitude—studies must be large in terms of geographic scope and time spans, and there is need for close integration with the work of the physical scientists.

Delimiting Research Problems Associated with the Tenure System

If the norm of maximizing the output of these resources that are committed to production is accepted, then all costs must be identified with the return of each resource in each use. We have suggested that the tenure system, in allocating rights in land through time and space, may preclude these identifications and thus create incentives that will result in malallocations of resources among firms.

[10] It is not suggested that this inhibition is applicable only to land—the use of any resource would be affected in the same manner.

The appropriate area of inquiry into the tenure system from the standpoint of efficiency of resource use would seem to concern the extent that the system fosters dissociation of costs and returns among firms. There is need for identification of those resources that give rise to offsite returns and incur offsite costs. Similarly, there is need for identification of those resource uses that yield their returns or incur part of their costs in subsequent time periods. Further, if alternative resource patterns are to be evaluated adequately, these interfirm and intertemporal costs and returns must be measured. As those who have engaged in some forms of water control work will attest, this is a formidable task. A water control structure on the Upper Missouri yields benefits in Louisiana—it yields benefits when completed and 50 years hence. This diffusion complicates the problem of measurement, but some approximation is necessary if resources are to be allocated reasonably well.

Finally there is the problem of suggesting institutional adjustments that will reduce the cost, in real terms, of the tenure system. The task, as we have suggested, is one of associating costs and returns, and only the social group has the length of life and power of control necessary to accomplish these associations. Once the dissociations have been identified and measured, what modifications in the ways of holding rights in land are necessary in order to recover benefits claimed in one firm from resources used in another? Or, conversely, how can a tax-bounty system be used to transfer the incidence of the cost of a resource organization from the farm or area where this cost in borne to the farm or area using the resource organization? The future of improving land use in the interfirm, intertemporal sense, lies in reducing these dissociations. It appears that these reductions can only be accomplished by institutional modifications.

This treatment of the interfirm, intertemporal problems of resource allocation as they are created by the tenure system does not deal with the full effects of tenure on resource use. The problems associated with the interfirm and intertemporal allocations remain, and these problems may outweigh in importance those we have discussed. The principles of allocations are the same, but the focus is on the problems of the firm.

THE APPLICATION OF EFFICIENCY TO FARM TENURE ARRANGEMENTS[1]

HOWARD W. OTTOSON
University of Nebraska

THE objective of this paper is to evaluate the application of the general economic framework outlined by Dr. Chryst in the previous paper in the analysis of the relative efficiencies of several tenure arrangements under which farmers operate. This discussion will draw importantly upon ideas resulting from a regional research project (popularly known as the MINK study from the initials of the four participating states, Missouri, Iowa, Nebraska, Kansas) which has been initiated by the North Central Land Tenure Research Committee.

The study under consideration envisages attention to most of the common tenure arrangements in the North Central Area. We recognize the considerable amount of previous interest in the relative efficiency of tenure arrangements, particularly leasing arrangements.[2] Most of the empirical work of the past has been based upon comparisons of two tenure arrangements, as for example, two leasing arrangements. In such comparisons, one becomes a norm for the other, being economically more desirable than the other in the attributes under consideration. Of course, any tenure system may in itself be subject to deficiencies that handicap the firm. We do not propose to accept any particular tenure arrangement as normative, but will attempt to subject each to economic analysis. The

[1] Published with the approval of the Director as Paper No. 730, Journal Series, Nebraska Agricultural Experiment Station. This paper has benefited greatly from the comments of members of the Agricultural Economics Department, University of Nebraska, particularly Don Kanel and Philip Henderson. Virgil Hurlburt and T. S. Thorfinnson of the Agricultural Research Service, U.S.D.A., also made valuable suggestions.

[2] See, as examples, Rainer Schickele, "Effect of Tenure Systems on Agriculture Efficiency," *Journal of Farm Economics*, 23:185-207, 1941; Louis Drake, "Comparative Productivity of Share- and Cash-Rent Systems of Tenure," *Journal of Farm Economics*, 24:535-50, 1952; D. Gale Johnson, "Resource Allocation under Share Contracts," *Journal of Political Economy*, 53:111-123, 1950; Earl O. Heady and Earl W. Kehrberg, "Relationship of Crop-Share and Cash Leasing Systems to Farming Efficiency," Iowa Agricultural Experiment Station Bulletin 386, 1952; Harald R. Jensen and Earl O. Heady, "Costs, Returns and Capital Requirements for Soil-Conserving Farming on Rented Farms in Iowa," Iowa Agricultural Experiment Station, Research Bulletin 423, 1955; Heady, *Economics of Production and Resource Use*, New York: Prentice-Hall, 1952, Chapters 20 and 21; C. Brice Ratchford, "Rental Arrangements in a Changing Economy," North Carolina Agricultural Experiment Station Technical Bulletin 108, 1954, pp. 22-27; T. W. Schultz, *Production and Welfare of Agriculture*, New York: The MacMillan Company, 1949, Chapter 12. Early attention to this subject is evidenced in L. C. Gray, Charles L. Stewart, Howard A. Turner, J. T. Sanders, and W. J. Spillman, "Farm Ownership and Tenancy," *U. S. Department of Agriculture Yearbook*, 1823, pp. 569-576.

object is to determine the extent to which each impedes the achievement of optimal combination and use of both human and capital resources.

Such analyses entail evaluation of the resource characteristics and resource productivities of farms under the various tenure arrangements. Our hypothesis is that tenure arrangements under which land is operated affect the allocation and use of the resources of the firm, and their resulting net returns, as well as the aggregate production of goods and services by agriculture as a whole. With quantitative specifications of adverse effects of tenure arrangements on resource use, a second hypothesis is that the obstacles to improved resource use and welfare can be isolated. Finally, remedial measures by which improved resource use and welfare may be accomplished can be worked out. We are interested in all barriers that keep tenure arrangements of any type from being efficient and from achieving satisfactory levels of income for farm operators. By removing the tenure oriented obstacles to maximum agricultural production, we hypothesize that any tenure arrangement can operate in the long run so as to enable farm operators to attain satisfactory income levels and to produce efficiently.

The Nature of Efficiency

The following discussion is oriented toward efficiency of the farm firm. We re-examine the nature of efficiency from the standpoint of farm firms at this point, and enumerate some qualifications. Any consideration of efficiency necessarily depends upon the definition of a means-ends scheme. A means-ends scheme assumes that resources can be measured and ends can be valued, at least in relative terms. In the case of farm firms we here assume that net income is the objective to be maximized. Of course, other goals besides income may be selected for maximization, and we appreciate the fact that farm families recognize other goals besides income in organizing their farm businesses. Income itself is a means to other goals.

Many factors keep farmers from equating marginal costs and returns. They have imperfect knowledge with respect to technical rates of transformation. They are unaware of alternative opportunities for employment of factors. The mobility of factors is restricted. Nonmonetary motivations exist. Some resources are nondivisable except in large units. In an efficiency analysis of alternative tenure arrangements cognizance must also be taken of other factors relating particularly to tenure that condition the resource structure, efficiency, and economic results of these alternative arrangements. These include operator's age, managerial experience and training, size of family, absence or presence of a family relationship (such as might condition a given leasing arrangement).

Under perfectly competitive conditions with perfect factor mobility and full economic knowledge the maximization of profits for the firm would be consistent with the maximization of production (and more ultimately welfare) for society as a whole. In an industry in which not all of the competitive conditions are present the resource allocation resulting in the industry's maximum contribution of net social product is not coordinate with resource allocation of individual firms toward the end of profit maximization. For purposes of our analyses here, however, we assume that farming is a competitive industry, that each firm operates in a competitive environment, that for the individual farm firm maximization of income is correlated with maximization of physical product. Widespread acceptance of reorganizational features tending toward increased efficiency, however, may or may not reduce the net income to the agricultural industry, depending upon whether or not the reorganization results in a saving of factors or an increase in output.

The matter of income level cannot be ignored in our conceptual analysis. Under perfectly competitive conditions, of course, income levels are no problem, since resources, including labor and management, are free to move from one firm and industry to another in the long run if the marginal returns do not equal marginal costs (including an opportunity cost for family labor and for the management factor). In the economic situation where the equilibrating conditions are not all present, income levels will reflect resource maladjustments of a non self-correcting nature. Income differences exist among alternative tenures in a given area for several reasons, including differences in size of farms. Thus an analytical problem would be present relative to size of farms in a tenure arrangement in which income levels were below standard, even though constant returns to scale existed, with presumably no possibility of more efficient use of resources in the static sense of allocative efficiency.

Effects of Tenure Arrangements on Resource Organization and Efficiency

The classification of farms under various tenure arrangements presents a definitional problem. Comparisons between a crop-share tenant 25 years old with two young boys, for example, and an owner-operator 40 years old with two nearly grown sons offers troublesome analytical problems. Or, a livestock-share tenant on 80 acres is in a different production (and perhaps tenure) class than one who farms 240 acres. Tenure arrangements can affect the types of managerial decisions and the pattern of resource use on farms in several ways. For our purpose we generalize these effects as follows: (1) division of the managerial function including decision making and the bearing or risk and uncertainty, (2) dissociation

of costs and returns (a) among individuals and (2) among points in time.

When two or more persons share in decision making the pattern of resource use and resulting production will be affected by the extent to which each shares in decisions, the quality of the managerial contribution of each, and the degree to which conclusive, effective decisions can be made by them. Of course, problems of joint decision making arise even on an owner-operated farm among family members. Dissociation of costs and returns occurs between tenant and landlord where the landlord shares in returns in production to which the tenant contributes all of certain resources, such as labor. Dissociation among points in time is illustrated in conservation inputs that might be feasible but not made by an operator due to insecurity in tenure. The affect of tenure on the division of risk and uncertainty is exemplified in the relatively higher degree of uncertainty born by the tenant under a cash lease than under a crop share lease.

Debt-free owner operator

The debt-free owner operator, who might arbitrarily be defined as having his real estate encumbered to the extent of not more than 15 percent of its value, has presumably the most freedom in the organization of his resources, as well as the most security of tenure. Thus he can plan for production for a long run period, and should be responsive to the changing demands of the economy as a whole, as registered in the market. More than 50 percent of farm owners in the North Central States had been on their farms ten years or more in 1950, as compared with nearly 60 percent of the tenants who had been on their farms less than five years.[3] Unity of managerial function is present, conditioned, of course, by such societal policies as acreage allotments and soil conservation programs. There can be complications, however, from the standpoint of over-all agricultural production efficiency. The planning period and interests of the firm are closely knit with those of the associated consumption unit, the family. The economic horizon may be short, and the economic goals of the firm may be other than maximization of income or production.[4] Further, for several reasons the firm may ration its own available resources as far as production is concerned, or may be subject to external capital rationing. Price and production uncertainty are characteristic of the economic environment in which it operates. In the pur-

[3] U. S. Agricultural Census, 1950.

[4] This is demonstrated in Earl Heady, W. B. Back, and G. A. Peterson, *Interdependence Between the Farm Business and the Farm Household with Implications on Economic Efficiency*, Iowa Experiment Station Bulletin 398, 1953.

chase of land the firm may have foregone other investment opportunities, such as livestock or other non-real estate capital, offering promise of higher returns.[5]

Research is needed concerning the following questions with respect to owner-operatorship:

(1) To what extent does the acquisition of ownership rights in land restrict the amount of capital left for other farming inputs, such as fertilizer, machinery and livestock?

(2) To what extent does the acquisition of land ownership result in farm units too small to utilize efficiently the operator's labor?

Analysis on these points is necessary to evaluate the ownership goal and the means of attainment. If the price paid for debt-free ownership in terms of goods and services, and welfare, appears high compared with other benefits of ownership, additional examination is necessary concerning the goal itself, or the means available to farmers in acquiring ownership.

Mortgaged owner-operator

The mortgaged owner in some ways is related to the part owner, except that a credit agent is a second resource claimant rather than a landlord.[6] His freedom in organizing resources and in making managerial decision is limited in varying degree by his creditor, varying from practically no "interference" experienced by borrowers from the Federal Land Bank and insurance companies to the substantial amount of managerial guidance to borrowers provided by the Farmers Home Administration.

The managerial decisions of the mortgaged owner, both with respect to enterprise combination and intensity of resource inputs will be conditioned by the way in which risk and uncertainty are shared by him and the lender. Where the encumbered owner commits himself to fixed interest and principal payments, his own equity assumes the uncertainty associated with his entire organization. The lending firm still bears some uncertainty due to the possibility of not being able to recoup its entire loan in the case of the foreclosure; but present appraisal procedures and loan limits minimize this source of uncertainty. When the operator's equity assumes all of the price and production uncertainty associated with both his own equity and borrowed capital, the necessity for keeping his capital structure liquid as insurance against uncertainty may dampen the operator's interest in long term investments. Other resource uses may

[5] This point is expanded in T. W. Schultz, *op. cit.*

[6] The mortgaged owner might be defined tentatively as an owner-operator whose real estate encumberment might be equivalent to more than 15 percent of the value of his real estate.

give promise of lucrative but uncertain returns. The operator may lessen risk by foregoing these types of opportunities.[7]

Variable repayment provisions in loans serve to shift some uncertainty from borrower to lender, without endangering the equity of the latter or necessarily changing the total terms of the loan. A larger transfer of uncertainty to lenders is accomplished under Frazier-Lemke type provisions. Finally part of the uncertainty stemming from variations in price and production, as well as that related to honesty of borrowers may be assumed by society as a whole, as under programs of the F. H. A. type.

Perhaps the high incidence of mortgage loans by individuals in agriculture (42 percent of farm mortgage loans in 1950 were from this source) is related in part to the problems associated with uncertainty. By means of informally determined flexibilities in repayment terms, individual lenders, perhaps often related to borrowers, probably assume a greater portion of farming uncertainties associated with their capital than do institutional lenders.

In addition to the bearing of uncertainty the encumbered owner will be subject to greater external capital rationing than unencumbered operators—his security may be already "used up"—and may forego certain profitable expenditures of a variable cost nature for this reason. As in the case of the full owner, encumbered owner operators may have purchased ownership at the expense of returns.

Questions meriting further investigation include:

(1) To what extent are the types, quantities, and productivities of resources used by encumbered owners handicapped by credit practices such as security and repayment provisions?

(2) What remedial measures and practices might be used to facilitate the use of borrowed capital by farmers in obtaining control of and using productive resources within the present legal framework?

(3) What institutional changes might facilitate the use of borrowed capital in agriculture by the reduction of uncertainty to borrowers and lenders?

Tenancy

In addition to the problems of dissociation of expenses and returns, tenancy is characterized by its division of the managerial function, including decision making and the sharing of uncertainty in varying degree. Conceptually there are three firms under leasing arrangements. First is the tenant firm interested in the maximization of profits or other objectives from the tenant's resources. Thus, under a cash lease the tenant

[7] Cf. Schultz, *op. cit.*

makes independent decisions concerning the cropping system. Second there is a landlord firm interested in maximizing returns to the landlord's resources. Decisions such as the selection of the tenant or investments in buildings may be made by the landlord alone. Third there is a landlord-tenant firm desiring to maximize the returns to the joint contribution of each and representing joint managerial decisions. This third firm may be relatively unimportant (as in a cash rented farm) or relatively important (as in a livestock-share lease). Managerial conflicts (or lack of cooperation) can arise because of difference in age, experience, or income-time preference. People who become landlords by investing capital in farm lands do so for several reasons. They may be retiring owner operators. They may invest to hedge against inflation, to speculate or to render income inaccessible to income taxation. Their motives in investing in land may bear on the types of decisions they make concerning the operations on their farm, as well as on the time span for which they make decisions.

Dissociation through time is created by the prospects of short tenure under an annual lease, which may cause the tenant to discount heavily the prospective returns from resource investments he might make that become associated with the landlord's resources and yield returns over a period longer than one year. Thus, although he might readily decide to apply nitrogen fertilizer, he would be less apt to apply phosphate fertilizer or lime. Investments in legumes, terraces and waterways would be similar. A further uncertainty occurs when a tenant investing in such items may render his tenure even less secure due to the willingness of other tenants to pay higher rents for improved farms. The tenant faces the alternative of paying more rent or of being removed as a result of his investment.

Similarly, landlords may discount heavily returns from additions to the present fixed plant because the lease provides for no additional returns. Of course many landlords keep buildings in good shape as a matter of pride; but others limit their investments to those necessary (1) to hold a good tenant (keep the present tenant's resources, including management, associated with the farm), a form of conservation measure since a "good" tenant may disinvest less of the landlord's resources than a "poor" one; or (2) to attract a new tenant, by which means he may realize a return on these expenditures.

A form of dissociation over time may also be present to the landlord because of "sticky" rents. In an inflationary period the fixed rent may lag behind the general price level, decreasing the landlord's real income and dampening his enthusiasm for other than the minimum expense. Finally, under short-term leases, he may be reluctant to invest in special-

ized facilities, such as a specialized cattle feeding setup, since the next tenant may not wish to use and pay for them.

Dissociation between landlord and tenants occurs because of the specialized resource inputs of each in the leasing arrangement. This will be elaborated further under the discussion of crop-share leases.

Cash Lease

Under the cash lease arrangement the tenant has a high degree of managerial freedom. He receives full return on the marginal inputs he applies. However, several factors impede farming efficiency on cash-rented farms. In the first place, uncertainty is created by the fixed cash rent commitment. The uncertainty to which the whole farm is subjected is not shared by the other equity holder, but is born by the equity of the tenant. In the face of variable prices and production the tenant is apt to try to keep his assets structure in somewhat liquid condition, at least by investing his working capital in enterprises that show quick returns, even at the expense of other more lucrative alternatives (exemplified in a tendency of cash-rented farms to turn more toward cash grain production than do owner-operated farms).

Thus, through dissociations and uncertainty, resource applications that might be economically very desirable from the standpoint of the farm as a whole may be unattractive to either landlord or tenant.[8]

Crop-Share Lease

The crop-share arrangement may involve either a straight share arrangement on all of the crops, or shares on cultivated crops and cash payment on pasture and hay land. In the second arrangement the landlord possesses greater managerial responsibility concerning cropping systems than under the cash lease, although there is much variation among individual landlords in the degree to which this responsibility is exercised. He also shares in production and price uncertainties in proportion to his share of the crops.

As in the case of cash renting, uncertainty of tenure, related to dissociation of costs and returns among points in time, inhibiting intensive resource use from the tenant's standpoint under the crop-share lease. Dissociation of costs and returns between individuals also affects intensity of production. First, the share rent represents a variable cost as far as the

[8] A rather comprehensive inventory of terms of leasing arrangements in the North Central Region has been made by the North Central Land Tenure Committee, reported in Virgil Hurlburt, *Farm Rental Practices and Problems in the Midwest*, Iowa Agricultural Research Experiment Station Bulletin 416, 1954. No attempt was made in this study to measure empirically the effects of these terms on farming production and welfare.

tenant is concerned. The intensity level where marginal revenue and marginal costs are equal to the tenant is lower than that where all costs and returns for the farm as a whole are considered. Accordingly, the tenant has an incentive to hold back inputs from which the output is divided with the landlord. In the same way the landlord has incentive to limit specialized variable inputs that he might make. The result is that the crop-share tenant has an incentive to use more land than owners or cash tenants.[9]

Another allocative problem on crop-share rented farms may be the transfer of inputs among enterprises due to the share structure. A tenant may tend to shift resources away from enterprises that are economically desirable from the standpoint of the farm as a whole, but for which the rental shares are relatively high.

Livestock-Share Lease

Under the livestock-share lease (unfortunately also called the 50/50 lease sometimes) allocative problems are not as difficult as under other leasing arrangements. Although both parties contribute specialized resources, they also share in a large part of the variable expenses, usually in shares corresponding to the division of the product. The landlord shares in the uncertainties of both crop and livestock production. Dissociation between individuals still exists because of the contribution of specialized, fixed resources like labor or buildings. Both tenant and landlord have an incentive to combine more of the other's resources with his own. Thus the interest of a livestock-share landlord is in dairy production, for example, and the interest of the tenant is in expanding the high-feed, low-labor hog enterprise.

The landlord is more heavily involved in managerial decisions than under other leasing arrangements, and unilateral decisions by each party are at a minimum. The close relationship in which landlord and tenant are thrown, as well as their mutuality of interests concerning production, may encourage them to solve their points of difference amicably. (They may also have more points of contact upon which to differ!)

Other considerations in leasing arrangements

One source of inefficiency not directly evident in static comparisons among tenure systems is the resource loss engendered by society when a tenant moves from one farm to another. In a sense part of the firm, specifically that composed of the landlord's resources, remains in one location; part of the firm moves with the tenant. However, part of the firm is lost to both the tenant and landlord in the process of disengage-

[9] D. Gale Johnson, *op. cit.*

ment. Some of these losses would include the following: (a) losses due to nonuse of specialized facilities by the next tenant, (b) location attributes associated with certain types of production, as the case of a tenant dairyman who moves from a Grade A milk route, (c) moving costs to the tenant, and (d) managerial skills of tenant acquired in coping with peculiar farming conditions. Such losses are inevitably a part of the adjustment process in farming. They may be excessive where the average tenure on a farm is six years, and where the modal tenure may be less.

The place of professional farm management with respect to resource use on rented farms presents an interesting problem on which little work has been done. Some professional farm managers furnish absentee landlords with the opportunity of contributing more managerial resources, with beneficial effects on farms as a whole, on tenants as well as landlords. Also possibly the net effect of their efforts is an income transfer from tenant to landlord by more complete exploitation of tenants' resources, with no necessary net benefit to farms as a whole.

A problem relating to all leasing arrangements concerns the relationship between soil productivity and the landlord's share. Research has shown that cash rentals and crop shares are remarkably uniform within given areas in which considerable variation in the productive capacity of land resources is presented. This phenomenom has the effect of increasing the dissociation of costs and returns between landlord and tenant, regardless of whether the rents are high or low, relatively.

Research is needed in the following areas concerning leasing arrangements: (1) determination of the extent to which leasing arrangements result in inefficient resource use, (2) analysis of the specific effects of division of managerial function, dissociation of costs and returns, and the ways in which uncertainty is divided between tenant and landlord on the productivities of land, labor, and capital on rented farms, and (3) determination of adjustments in rental arrangements that would result in greater efficiency of resource use.

Part ownership

The case between full owner and tenant involves unilateral decision making on the owned part of the farm, and more complex decision making processes on the rented part. There will probably be a tendency toward greater intensity of production on the land owned by the operator. The productivity per input of operator's resources is higher on owned land than on a tract rented under a share lease. The notion is commonly suggested that part-owners tend to spread on their owned tracts the manure resulting from feed grown on their rented tracts, thus effecting a transfer of fertility. Operators will likely give priority to the owned tracts

with respect to expenditures of working capital where capital is rationed. They may also favor the owned tracts in timing of crop operations during crucial periods. This tendency toward less intensity would be less true where the rented part is under cash lease, although even here the operator will have little or no incentive to make expenditures for inputs that become associated with the landlord's resources and that do not produce returns in the same year. Where the tract is rented under a cash lease, however, the operator faces relatively greater uncertainty on the rented tract as compared with his own tract, for reasons already suggested. This may provide an incentive toward less intensity on cash rented tracts also, because of the discount on expected returns.

Problems of Dynamics in Analyzing Relative Efficiencies

Conservation

In analysis of relative efficiencies of tenure arrangements cognizance must be taken of the effects of tenure arrangements on resource use in the long run—in other words, the relationship of soil conservation and tenure arrangements. Tenant-operated farms have been accused by some of being soil depletive.[10] Others have suggested that some owner-operated farms, for several reasons, also deplete their soil resources.[11] The apparent deviation between the long run interests of society as a whole and the shorter span of interest of individual producers is at the base of the problem. Some tenure arrangements shorten the economic horizons of farmer operators by uncertainties associated with the tenure arrangement itself. Thus in studying the relative efficiency of farms under alternative tenure arrangements it is probably as necessary to evaluate the degree of maintenance of the soil resources, consistant with societal objectives, as it is to measure static productivities at a given point in time. In other words, the contribution that is being made to derived productivity coefficients by depletion of the capital plant must be recognized, particularly in an easily eroded area.

Survival capacity

Another attribute related to dynamics is the ability of a firm to withstand the shock of economic adversity. Some uncertainties associated with tenure systems themselves have been mentioned previously. Likely these uncertainties and efforts by operators to preserve their firms in spite of them, are reflected in different capital structures under different tenure arrangements. Useful here is the concept of a homeostasis of the balance sheet, the notion that the firm has an ideal equilibrium capital struc-

[10] Shickele, *op. cit.*, p. 200.
[11] Harris and Ackerman, *Family Farm Policy*, p. 131.

ture that it wishes to maintain. When forces disturb this equilibrium the firm takes steps to restore it.[12] In some firms it is likely that favorable "asset ratios" and "assets-liabilities" ratios weigh more heavily in influencing production decisions than input-output ratios. Efforts on the part of the firm to maintain liquidity, or structural safety, may result in resource combinations that are far from efficient in the input-output sense. Of course farmers undoubtedly include many assets and liabilities in their mental balance sheets that are not recognized in the usual product of an accountant. Thus a good credit rating, or a father with surplus resources, are very real resources affecting production decisions. Of what importance is attention to capital structure? Knowledge of capital structures, and the attitudes of farmers toward them are essenial in explaining resource combinations under alternative tenure arrangements, as well as in serving as guides to which remedial measures may be oriented.

Family-firm relationships

A dynamic factor somewhat related to capital structure is the life cycle of the farm family. Empirical work suggests the close relationship between the family life cycle (and operator's age) and acres of land operated, labor supply, and production.[13] Diminishing marginal productivity of capital related to age of operator has been noted in the same work. In the meantime census data show the average age of operators in three tenure groups as follows, for 1950:

Owner operators	52.5
Part owners	46.7
Tenants	40.4

Similar comparisons were noted in the Iowa study. This relationship between age and tenure is obviously important to comparisons among alternative tenure arrangements with respect to production efficiency. By ignoring this variable it might be easily concluded empirically that the marginal productivity of capital on rented farms is high and that of labor is low, as an effect of the tenure arrangements directly, while in reality the organization of resources might be a function of the family life cycle.

The family-farm cycle, and the associated concept of the agricultural ladder can be formulated in terms of decisions concerning resource control and use that a farmer makes at crucial points in his career.[14] Thus a young beginning farmer has to decide how he can best gain control of land and other capital resources that he can combine with his own

[12] This notion is developed by K. E. Boulding, *A Reconstruction of Economics*, New York: Wiley and Sons, Inc., 1950, Chapter 2.

[13] Heady, Back and Peterson, *op. cit.*

[14] I am indebted to Professor Don Kanel for this formulation.

limited labor and capital. As he gains experience, increases the size of his family, and accumulates capital of his own, he makes additional decisions as how these shall be committed, as among land, livestock and machinery. Still later he has to adjust to diminishing family labor supply, while perhaps having increased capital at his disposal. The tenure arrangements themselves, as well as the organization of his resources may be conditioned strongly by these strategic decisions, and the availability of resources at the time they are made.

Effect of landlord-tenant cooperation on productivity

The degree of efficiency of production on rented farms is also a function of the degree of agreement between the landlord and tenant. Where the tenant and landlord work together the productivity of given measurable resource inputs may be higher than where amicable relations do not exist, with consequent uncertainty especially for the tenant. In a sense another resource—human relations—is being brought to bear.

Farm tenure and resource adjustments

The nature of the hypotheses presented points to a need for intensive empirical effort in comparing the efficiency of resource use and the related causal factors under various alternative tenure arrangements. Such analysis should include measurement of productivity at the margin as well as average productivities, and associated resource structure. Corollary to such analysis ought to be a definition of the obstacles to more efficient allocation of all types of resources, and rather intensive inquiry into the changes in tenure, lending and legal institutions that presently hinder resource use and welfare.

TWO EMPIRICAL TECHNIQUES APPLICABLE TO LAND TENURE RESEARCH: LINEAR PROGRAMMING AND SINGLE EQUATION MODELS*

W. D. TOUSSAINT**
North Carolina State College

IN THIS paper some possibilities of single equations and mathematical programming in tenure research will be explored briefly, and some evidence of an exploratory nature will be presented in the use of programming to estimate the effect of leasing arrangements on allocation of resources within a multiple-unit farm.

At the outset, it should be made clear that these two empirical techniques, single equations and programming, are quite different in procedure as well as in some of the assumptions underlying their use, and they can be expected to be useful for different types of problems. That is, the techniques are not substitutes, but rather one may supplement the other. One point of differentiation should be made clear. The production function is designed to give us information about what an actual situation is. With programming, we expect to obtain a discrete optimum, given some end to maximize and with certain resource limitations.

If one scans the publications of state experiment stations, a host of bulletins can be found pertaining to the subject of land tenure, particularly leasing arrangements. These publications are largely descriptive with some emphasis on recommendations and with only occasional references to features of the particular tenure system in question that tends to bring about resource malallocation.

Some of this literature, mostly recent, contains fairly comprehensive treatments of the effect of various leasing arrangements on farming efficiency. Although these studies have been largely theoretical, some empirical evidence has been produced relative to the effect of cost sharing on intensity of input use, for example, the risk discount effect of fixed cash rent, and the effect of lease type on size of farm.[1]

As stated in Dr. Ottoson's paper, past efforts to analyze efficiency of alternative tenure arrangements have been directed largely toward comparisons of one leasing arrangement with another. Little if any work has been accomplished in the area of estimating the over-all efficiency of any particular tenure category. For example, as has been pointed out by

* Journal article no. 668 of the North Carolina Agricultural Experiment Station.
** The author is indebted to C. E. Bishop, C. G. Hildreth, R. A. King, and J. G. Sutherland for helpful assistance and criticism.

[1] Earl O. Heady and Earl W. Kehrberg, *Relationship of Crop-Share and Cash-Leasing Systems to Farming Efficiency*, Iowa Agricultural Experiment Station Research Bulletin 386, 1952.

Schultz, there are reasons to believe that under certain conditions some forms of leasing might lead to even more profitable use of available resources than would owner-operatorship.[2]

Certain provisions of leasing arrangements seem to lend themselves fairly well to theoretical scrutiny. For example, the effect of sharing costs on intensity of input use can be readily seen from a theoretical standpoint. The effect of short tenure or expectations of short tenure on the durability of investments which a tenant would be expected to make also seems to be quite clear. However, other factors, such as the effect of a short-term lease on a tenant's incentive to produce in order to be allowed to remain on a farm and the effect of sharing arrangements on labor intensity, are far more nebulous. There does not seem to be any one common lease type, or tenure situation for that matter, that has all attributes either better or worse from the standpoint of efficiency, than some alternative arrangement; that is, with the possible exception of an owner-operator having virtually unlimited capital. As examples, it is impossible to say *a priori* that a cash lease is more efficient than a crop-share lease or that owner-operatorship with a large mortgage is more efficient than tenancy.

Use of Single Equations

Since any one tenure situation may have some characteristics that tend to promote more efficient resource use than an alternative tenure situation and some that tend to bring about less efficient use of resources, efficiency may be increased by determining for particular situations the type of tenure organization that is most efficient as a whole.[3]

Determining over-all efficiency of existing arrangements is where single equations may provide a useful tool. In order to obtain a measure of the relative efficiency of any tenure group as compared with another tenure group, production functions could be derived for the respective groups. These functions could then be tested to see if there is any significant differences among the functions and to see if resources are organized in a more efficient way in one group than in the other.

Even though such an analysis were made and statistically significant results were obtained, the particular provisions tending to make one tenure system more efficient than another would not be isolated directly by such a procedure. If one tenure system were shown to be more efficient

[2] T. W. Schultz, "Capital Rationing and Farm Tenancy Reform," *Journal of Political Economy*, 48:309-324, 1940.

[3] This has been suggested in somewhat different terms by D. Gale Johnson, "Resource Allocation under Share Contracts," *Journal of Political Economy*, 43:111-123, 1950.

than an alternative system, clues could probably be found as to the particular facets of the system that brought about a more efficient allocation of resources.

Some people see a certain beauty in a production function. The exact mathematical form of such functions tends to make people think that "this is it." Unfortunately, production functions can be misleading. The function is an average relationship based on a sample from a given universe. The high degree of heterogeneity among farms is common knowledge, and a large amount of useful information is obscured by this averaging process. The aggregation of inputs into theoretically reasonable and operational categories also has been a most troublesome problem in the use of production functions. Perhaps the greatest difficulty in the use of production functions comes in choosing the form of the equation so as to conform to reality. This becomes very complex as the scope of the function is enlarged.

The concept of using single equation methods in order to compare efficiencies would seem to follow in view of the problem at hand. But I must admit to considerable skepticism as to the validity of results that can be expected from such a procedure. Hoch has shown rather drastic changes in Cobb-Douglas coefficients when the variation due to firms was removed by an analysis of covariance technique.[4] For example, the sum of the coefficients for a Cobb-Douglas function, which indicates returns to scale, was reduced from 1.0 to .6 by including the firm variable. The very fact that such results are obtained should at least cause considerable caution on the part of investigators in their interpretation of results obtained from single equation methods.

Linear Programming and Tenure Research

Because production functions and other analytical methods based on average relationships tend to obscure many farm-to-farm variations, a fruitful approach in determining the effect of tenure on resource allocation might be to examine individual situations in considerable detail. In order to look more closely at the effect of alternative arrangements on individual farms, the budgeting technique has been used. Some work with budgeting has already been carried on in the area of tenancy and soil conservation.[5]

---

[4] Irving Hoch, "Estimation of Production Function Parameters and Testing for Efficiency," Paper presented before the Econometric Society, Montreal, Canada, September, 1954. An abstract can be found in *Econometrica*, 23:325, 326, July, 1955.

[5] See Harold R. Jensen, Earl O. Heady, and Ross V. Baumann, *Costs, Returns and Capital Requirements for Soil-Conserving Farming on Rented Farms in Western Iowa*, Iowa State College Research Bulletin 423, March 1955.

In testing any tenure system for efficiency, there must be some norm with which to compare the system. Debt-free owner-operatorship has fewer restrictions upon resource use than any other form of tenure. Under owner-operatorship, resources are provided by one individual who also receives all of the returns. There is no splitting of the managerial function to complicate matters. Because of these factors, a tenure system that allows as efficient operation as is possible under owner-operatorship might well be thought of as an efficient type of tenure.

Using this owner-operator norm, a farm can be programmed to obtain the optimum enterprise organization under owner-operatorship, given the technical coefficients of production, product and factor prices, and resource limitations. If the farm were programmed a second time, this time including the provisions of the tenure system under study, an optimum for the particular tenure arrangement would be obtained. The difference in enterprise organization and farm net revenue between this new optimum and the optimum under owner-operator conditions can be said to be due to the provisions of the particular tenure system being analyzed.

In programming different tenure systems, there are essentially two ways in which the arrangements of the system under study will bring about a change in optimum plans. The optimum plan will be affected by the resource limitations or by the net revenues assigned to enterprises. Landlord and tenant imposed restrictions, capital limitations, labor availability, and acreages will enter into the resource limitations. Cost and income-sharing arrangements will affect the result through the net revenues.

By programming a farm under owner-operator conditions and then under the tenure provisions, it will be possible to determine if the farm income is reduced measurably under the tenure system. If income is found to be lower, the really important steps involve isolating the conflicts and determining remedies for the provisions that are bringing about the inefficient use of resources.

An Example

As an example of the use of linear programming in this field, a 145-acre multiple-unit farm representative of a large farm in the Southern Piedmont Area of North Carolina was programmed. Budgeting data were supplied by Sutherland and Bishop[6] from their study of Southern Piedmont farms. The farm was assumed to have an owner-operator and two

[6] J. Gwyn Sutherland and C. E. Bishop, "Possibilities for Increasing Production and Incomes on Small Commercial Farms, Southern Piedmont Area, North Carolina," North Carolina Agricultural Experiment Station, Technical Bulletin 117, Dec., 1955.

tenant families, and the available labor resources were divided into two-month periods (Table 1). At least 23 acres of the 145 acres would be in pasture. Row crops were limited to one-half of the cropland, or 61 acres, and a cotton allotment restriction of 15 acres was imposed. No restrictions were placed on investment capital or operating capital. The enterprises included corn, oats with lespedeza, alfalfa, layers, hogs, sheep, spring steers, and dairy cows (Table 2).

As a first step, labor of all three workers was combined and the farm planned as though there were one decision-maker and three laborers. The quantity to be maximized was net revenue for the farm as a whole, where net revenue was defined as total receipts less variable costs. Second, the farm was programmed with the same restrictions but with the further restriction of separate landlord and tenant enterprises. The maximand or

TABLE 1. ASSUMED RESOURCE LIMITATIONS FOR 145-ACRE MULTIPLE-UNIT FARM

		Landlord	Tenants	Total
Hours of labor	J—D	579	1120	1699
	F—M	576	1114	1690
	A—M	700	1354	2054
	J—J	913	1766	2679
	A—S	816	1578	2394
	O—N	722	1396	2118
Total		4306	8328	12634
Acres cropland		122	—	122
Acres row crops		61	—	61
Cotton allotment		15	—	15
Cropland and pasture		145	—	145

quantity maximized in this case was landlord net revenue. With the new restriction of separate enterprises, the number of possible enterprises, of course, was doubled.

On a farm where tenant labor is used, the way that costs and returns are shared for the enterprises will have a substantial effect on the optimum enterprise combination. In this case a 50-50 sharing of returns from all enterprises and a sharing of all variable costs other than machinery operating costs was assumed. The landlord supplied machinery and paid for all tractor operating costs. One might, I think, anticipate that such an arrangement would be relatively efficient.

The optimum plan obtained for the farm with labor of the three men combined called for 56.1 acres of corn, 28.2 acres of alfalfa, and 122 sows producing two litters each (Table 3). The net income to the farm under this arrangement was $17,884. Risk was not included in the program. To reduce risk, farmers would likely spread themselves over more enterprises than appeared in the optimum plan. Also, a restriction on investment

TABLE 2. RESOURCE REQUIREMENTS AND NET REVENUE FOR ENTERPRISES USED IN PROGRAMMING 145-ACRE MULTIPLE-UNIT FARM*

		Cotton 1 acre	Corn 1 acre	Oats and lespedeza 1 acre	Alfalfa 1 acre	Layers 1000 hens	Hogs 5 sows	Sheep 35 ewes	Dairy 8 cows	Beef 1 spring steer
Hours of labor	D—J	.5	.5	0	0	180.0	50.0	30.0	158.2	0
	F—M	.7	1.4	1.0	1.0	252.0	65.2	102.4	165.9	1.5
	A—M	7.3	5.1	0	8.0	242.0	62.0	45.0	141.1	2.0
	J—J	7.1	2.4	2.6	4.0	180.0	52.0	44.2	137.3	2.0
	A—S	18.9	0	5.4	5.2	180.0	64.0	44.0	159.2	4.0
	O—N	74.4	9.7	4.2	0	168.0	64.8	22.4	148.1	2.0
Cropland		1.0	1.0	1.0	1.0	0	0	0	2.5	0
Row crops		1.0	1.0	0	0	0	0	0	2.5	0
Cotton		1.0	0	0	0	0	0	0	0	0
Cropland and pasture		1.0	1.0	1.0	1.0	0	2.5	9.0	18.5	1.5
Net revenue		178.02	83.95	47.33	49.31	864.48	482.94	317.04	1362.88	10.52
Landlord net revenue**		85.32	39.00	20.10	23.51	426.84	233.82	155.15	609.21	5.26

* The data represent the amount of the various resources needed to produce a unit level of an enterprise.
** Landlord's net revenue for those enterprises operated by the tenants.

TABLE 3. OPTIMUM ENTERPRISE COMBINATIONS FOR 145-ACRE SOUTHERN PIEDMONT FARM WITH TENANT AND LANDLORD LABOR COMBINED AND WITH LABOR SEPARATED*

	Labor combined			Labor separated								
				Landlord**					Tenants			
	Corn	Alfalfa	Hogs	Corn$_L$ 1 acre	Oats and lespedeza$_L$ 1 acre	Alfalfa$_L$ 1 acre	Hogs$_L$ 1 sow	Cotton$_T$ 1 acre	Hogs$_T$ 1 sow	Cotton 1 acre	Hogs 1 sow
Units	56.1	28.2	122	57.1	2.9	32.4	12	3.9	85	3.9	85
Net income per unit	83.95	49.31	96.59	83.95	47.33	49.31	96.59	85.32	46.76	92.70	49.83
Net income	4709.60	1390.54	11783.98	4793.54	137.26	1597.64	1159.08	332.75	3974.60	361.53	4235.55
Individual income		—				$11,994				$4,597		
Farm income		$17,884				$16,591						

* A multiple-unit operation with one landlord operator and two tenants.
** The subscripts refer to landlord enterprises (L) and tenant enterprises (T).

capital would have caused a shift in enterprise combinations; one effect of this would have been a reduction in the number of hogs. Changes in assumed prices of products or resources would alter the optimum combination of enterprises. For example, a reduction of $1.90 per hundredweight for hogs would have brought about a shift in the optimum plan.

When landlord income was maximized, six enterprises entered the program. The landlord had 57.1 acres of corn, 2.9 acres of oats with lespedeza, 32.4 acres of alfalfa, and 12 sows; the tenants had 3.9 acres of cotton and 85 sows. Such a large hog enterprise operated by tenants would surely not be customary in the Southern Piedmont Area.

With this second program, landlord net revenue was $11,994, and the net revenue of the two tenants together was $4,597. The aggregate farm net revenue amounted to $16,591 or $1,292 less than under the optimum program where the maximand was farm income. The net revenue difference between these two plans and the change in enterprise combination gives us an indication of conflicts brought about by the splitting of a farm into a multiple-unit organization with separate enterprises for owner and tenants.

At least one change in enterprises is fairly informative. When landlord net revenue is the maximand and tenants and landlord have separate enterprises, the landlord then finds it profitable for the tenants to grow cotton. Tenant cotton becomes a profitable enterprise for the landlord under this arrangement because cotton takes the same land resources as corn but requires no landlord labor.

The $1,300 difference in net farm revenue between the two optima can be considered to be a maximum amount of compensation. That is, this is the maximum amount of money that the landlord could afford to pay the tenants to change the enterprise combination to that of the plan with combined labor. In this case this would mean a change in the method of tenure. A change to a hired man operation instead of the cropper system is one possibility. The interpretation of this compensation in this case would be that this is the maximum amount that the landlord could pay the tenants as hired men in excess of what they would receive as croppers and still be as well off as he was under the cropper system.

The reduced net farm revenue was due in part to the shift in enterprises, but another factor also appeared to play an important role. When the separate enterprise restriction was imposed, six labor limitations were added to the program. In total, 1,068 less hours of labor were used under the plan where landlord income was maximized than under the plan where net farm income was the maximand (Table 4). Flexibility in the use of labor was reduced by assigning separate enterprises to individuals rather than combining the labor.

The fact that 205 hours of landlord labor in February and March is unused while tenant labor in this period is limitational and 269 hours of April and May tenant labor is unused while landlord labor is limitational suggests that at least some improvement in net income could be obtained by an exchange of labor in these two periods.

This example of the use of programming in the tenure field is not a complete analysis. It is intended to be merely suggestive of the possibilities of this technique as an aid in diagnosing inefficiencies of existing

TABLE 4. UNUSED RESOURCES FOR TWO OPTIMUM PLANS, TENANT AND LANDLORD LABOR COMBINED AND LABOR SEPARATED*

		Labor combined	Labor separated		
			Landlord	Tenant	Total
		Unused resources	Unused resources	Unused resources	Unused resources
Hours of labor	J—D	457	432	266	698
	F—M	0	205	0	205
	A—M	37	0	269	269
	J—J	1169	515	852	1367
	A—S	700	479	413	892
	O—N	0	0	0	0
Total		2363	1631	1800	3431
Acres cropland		38**	26	—	26
Acres row crops		5**	0	—	0
Cotton allotment		15	11.1	—	11.1
Cropland and pasture		0	0	—	0

* A 145 acre multiple-unit operation with one landlord and two tenants.
** All acres were used but the limit was not reached for this resource restriction.

tenure arrangements and in providing insight into remedies for these situations.

Other Uses of Programming

I have discussed the use of programming for analyzing a multiple-unit operation, a type of organization common in the Southeast. The technique is not limited to such a problem, however. Points of conflict between landlord and tenant on rented farms where the owner is not an operator might be pointed out by programming farms, first to maximize landlord income and second to maximize tenant income under given lease conditions. In this way, remedial measures might be worked out that would tend to improve both landlord and tenant income and at the same time reduce the divergent interests of tenant and landlord to a common interest in terms of the optimum enterprise organization. Presumably, as stated above, this norm toward which work should be directed could be that of the unencumbered owner-operator.

Another possible use of mathematical programming involves consideration of the relative efficiencies of tenancy and encumbered owner-operatorship, given a particular asset bundle. There is reason to believe that this type of problem might also be investigated with worth-while results using programming methods. Here an investigator might be interested in determining net income under alternative tenure arrangements, given a family's bundle of assets. In other words, this involves maximizing returns from a family's resources rather than a maximization of returns for a firm.

Mathematical programming of individual farms avoids the problem of aggregating and averaging over nonhomogeneous farming units. The technique is not free of criticism in terms of applicability to reality, however.

The linearity assumption is still bothersome, but, in most cases, linearity seems to approximate the real world rather well. Another big problem is the incorporation of risk into programming. Although still an unsolved problem, work is being done in this area.[7]

Another point that could cause considerable difficulty is the programming of a farm to include the incomes from several years. In the first place, physical data of yields over time under alternative cropping systems are not reliable. The effect of tenure systems on income over a period of time is a very important but complex problem. The computations might be difficult with programming, but it can be done if physical data are sufficiently accurate to warrant the trial.

Certain assumptions are necessary in order to apply either single equation methods or mathematical programming, and the analyst must recognize these assumptions. We hope that the application of rigorous analytical methods in tenure research will lead to results that do more than describe but actually provide further information with respect to improvement of resource allocation, individual and social welfare.

[7] See R. J. Freund, "The Introduction of Risk into a Linear Programming Model," Unpublished Ph.D. thesis, North Carolina State College, 1955.

DISCUSSION: RELATIVE EFFICIENCIES OF ALTERNATIVE TENURE SYSTEMS

VIRGIL L. HURLBURT
Production Economics Research Branch, ARS

The need in research in land tenure is for a workable system for distinguishing between the crucial relevant and the appendant inconsequential. Stated another way, the need is for a framework within which agricultural economists may operate and a set of analytical tools for the operations they perform. This

requires understanding of ideas and communications of them, so that any two economists know when they are talking about the same things, whether in defining the problem upon which they are working or in performing the analytical manipulations.

The three related papers go a long way in performing this task of formulating and integrating. We have not passed the point of diminishing returns in tenure research in the use of the efficiency framework, nor begun to exhaust the possibilities of it in recognizing and defining problems, or in devising solutions to problems. One explanation for the diversity of results shown in published reports, for the emphasis on description, and even for the existence of dichotomy among schools of thought, is that the power of theory to synthesize has not been fully recognized, and sufficient distinction has not been made between the theoretical structure per se and analytical devices that can put theory to work.

A brief look at some of the criticisms that have been and will continue to be made of the efficiency framework will help to show how some of these criticisms illustrate the need for some usable framework. In fact, one of the needs in land tenure research is for some method of determining, without too much bias, just when or when not the criticism is a valid proposition.

The efficiency concept abstracts from reality, and supposedly does not deal with a number of problems that people face—a sin for which the theory is strongly and sometimes wrongly condemned. In this respect, one can wonder, with something more than philosophical musing, about the function of theory in science, and raise questions about the meaning of a normative concept if it is not to provide some way of treading through the maze of complexity known as reality in this everyday world. One problem in any form of tenure, for example, is that of finding a farm with the desired characteristics, by either a landlord, a tenant or an owner-operator. Contrary to the argument usually offered, the efficiency concept offers much in the solution of this problem. We have here a particular case in which application of the analytical components of the theory helps to define the problem, rather than a case in which the theory does not apply because it overlooks the problem. The limitation is in application, not in construct. Specifically, the theory gives the individual a basis for choosing among farms, and for balancing the attributes of one against those of another. This is the task of visualizing the factor-factor substitutions and of determining marginal rates of substitution, factor for factor. Also, the theory gives a basis for making comparisons between renting and ownership as methods of operation.

Unfortunately, the efficiency criteria do not tell the individual exactly where to go to find what he is looking for. But, if we look back into the assumptions of equilibrium, and visualize the concept of the perfect market, we have a guide as to the direction of effort in providing people with information (or ideas) to solve their own problems in finding farms. This kind of improvement in the operation of the land market—making real estate as freely transferable as automobiles—would, of course, be contrary to any such value judgements as "agriculture, the bulwark of democracy."

The above example provides further illustrations concerning the significance of assumptions within a given theoretical framework, the importance of defining problems, and the necessity of integrating so-called institutional and orthodox theory. First, orthodox theory is criticized because it assumes tacitly (if not explicitly) that the individual has freedom to act within his opportunity horizon

as conditioned by his knowledge and wealth, whereas everyone knows that this freedom does not exist. Further, orthodox theory in research application, at least in the efficiency framework, assumes wealth distribution and the state of the arts as given. Therefore, the model is static and unrealistic.

Chryst has dealt effectively with statement of the problem of dealing with institutional forces, a most essential step in bridging the gaps among schools of thought. One school denies the other because it assumes away part of the problem—the most important part; and the second school denies the first because it refuses to apply the relevant analytical constructs. We have one historical example in which the gap has been bridged. I refer to the development and application of the theory of imperfect competition. Revision of the concept of perfect competition is a specific case in which institutional forces—the action of one firm as affected by the probable actions of another—are worked into and become a part of orthodox theory. I think that this type of integration can be performed for land tenure mainly by *applying* existing theory, rather than by developing "new" theory.

Again as illustration, take a look at differences in interpretation of the indifference curve as an analytical construct. Interpreted too narrowly it loses meaning. The choice between working and leisure is depicted geometrically as a downward sloping curve (a marginal rate of substitution) which shows that it takes more pay per hour to substitute for leisure as the number of working hours increases. In narrow interpretation this explanation of relation between variables is criticized because everyone knows that a man will often forego working for a higher rate of pay in order to assist a neighbor at considerable expenditure of effort and with no thought of monetary reward. In this same setting, the indifference concept is criticized because, it is argued, people are not consistently rational in their choices. Even though choosing A over B and B over C, one will not necessarily choose A over C. But I have heard of no one who denies the Mendalian principle in biology merely because a black sheep shows up in a white flock. Departures from the rule do not deny the rule. The indifference concept is still a usable construct in understanding the making of choices. Whether or not people always act rationally may not be the important question. Presumably they will have to act rationally, within given opportunity horizons, if they want to achieve their maxima in satisfactions. (This is the means-end scheme mentioned by Ottoson.)

One cannot expect to solve the controversy of static vs. dynamic models in one short paragraph. But, one can attempt a couple of observations. The first is that mere designation of a model as static is not necessarily a sufficient basis for condemnation. People still have to make choices at particular points in time.

Also, we do have the technique of designating identical inputs at different points of time as different inputs, thus taking account of movement through time; and it has been conveniently and appropriately argued that the static model as a whole is only a special case of the dynamic, in which instantaneous adjustments are assumed. Here is another case of the necessity of making the assumptions specific. Secondly, there is the question of whether the given analysis is dealing with structural relations or with functional relations—whether the analyst is delimiting the skeleton of a system or is concerned with the workings of the parts of it. This is the difference between process analysis, in which dynamic models are needed, and structure analysis at a point in time, in which a static model suffices.

Part of the objection to use of the efficiency concept seems to come from

the fact that a set of problems and of objectives other than those of maximizing returns from a given total outlay are involved. Attention is devoted to problems of wealth distribution, the institutional barriers that preserve inequalities within our social structure and prevent equal access to opportunity. The efficiency framework and firm analysis do not apply to these distributive problems. Chryst mentions the need for taxation and other social implementations to deal with the distributive problem. In addition, there is need to define objectives and problems more clearly, to see the relations between production theory with its associated set of assumptions and the distributive problems. More important is the possibility of applying the same analytical devices to the two sets of problems—particularly the incremental analyses in the framework of economic efficiency. In analysis of any two sets of income distributions, comparisons must still be made between increments of output associated with increments of input.

Admittedly, the assumptions necessary to theoretical analysis of problems at the firm level must be relaxed to deal with problems of economic growth, resource allocation and income distribution at the national level. Theory of the firm employs only a *few* of the marginal conditions of maximum social welfare, whereas welfare economics employs them all.

There is a need to revise classical concepts and definitions, particularly some of the Ricardian ones, to fit the needs of analysis of both sets of problems—that is, maximum production from given sets of resources in their institutional environment and revision of systems and institutions. Among these is the long controversy over the definition of land and the differences between land and capital as factors of production. The point here is to take another look at the definition of a factor. The important distinction is not among broad classes of aggregate inputs, or the differences between man-made vs. natural resources. Instead, it is in treating all inputs as capital inputs in the determination of rates of substitution, input for input, and to define as one factor any two items that are perfect substitutes.

The task remains to point out a few specific objections to statements as given in the two papers. One is the necessity in both papers of indicating the assumptions. For example, Chryst suggests that the equimarginal principle is the same as equating marginal cost with marginal return (in a footnote). Using the concept of alternative or opportunity cost, theory of the firm under the assumption of unlimited capital, this is the case. In the firm with limited capital the equimarginal principle is achieved by equating the ratios of marginal costs and marginal returns. The surprising thing is that when two economists exchange ideas often the main difference between them is in the nature of their assumptions.

In Ottoson's paper there are two terminological cases. One is the reference to the leased firm as being made up of three firms—the landlord, the tenant and the landlord-tenant. This is an injustice to usual terminology, to define a resource owner, a decision maker, and a firm as synonymous. But I am not quarreling with the basic idea of three separate entities. The other is the implicit definition of uncertainty, which in the discussion of the cash lease includes the element of risk. The fixed cost of the cash lease is a certainty, in that both landlord and tenant know with certainty what the rental payment will be. But one must agree that the cash lease involves more risk for the tenant, assuming the same size of business, than does a share lease.

Also, Ottoson's presentation from a construct view might have emphasized more that the usual characteristics of leases that affect resource allocation are

characteristics as found in practice. Any one type of lease may direct the operations of a farm firm as efficiently as can another; and the main reason for differences in types of leases are explainable in capital positions of the two parties. Here one needs to tie back into the theoretical model, which is a farm firm with given resources operating at the highest profit combination, for which the necessary and sufficient conditions can be specified.

If one carries this conceptual model into the analysis of tenure forms, stratification will need to be made within forms. In spite of the fact that the owner operator free of debt is generally less restricted than is any other type by tenure conditions, comparisons by these broad types cannot expect to disclose purely tenure restrictions on allocation of resources. Substratification by capital position or by total value of resources is needed, because the capital structure of the small owner-operated firm may have far more limiting effect on resource allocation than in the case of the tenant firm with the tenant having sufficient operating capital.

These few instances of changes in wording, or in statement of assumption or addition to method of sampling and stratification, do not quarrel with the general thesis of the papers. The problem is to no small extent a problem in measurement, a problem that is confounded by the fact that the inputs are not all infinitely divisible—for both technical and institutional reasons. In both the conceptualization and its application it should be possible to generalize and simplify, so that we can *see* and *understand* the basic economic problems involved.

DISCUSSION: RELATIVE EFFICIENCIES OF ALTERNATIVE TENURE SYSTEMS

W. E. HENDRIX
University of Chicago

The papers by Messrs. Chryst, Ottoson and Toussaint have so much a common thread of thought underlying or running through them that the major virtues and weaknesses of one are contained in the others. Hence, instead of treating the papers separately, I shall direct my comments to the general thesis and assumptions common to the three papers.

The most basic guide to an evaluation, as well as to the construction, of a research framework and its related concepts and techniques is the problem for which these are to be used. For considered apart from the problem at issue in it, one research framework is as good as another, no matter how incoherent it is. In the views presented here, our land tenure problems are foremost of all problems in the allocation of resources to achieve the largest possible material income on individual farm firms. Compared with this objective, the problem of distribution is held to be of secondary importance and analytically separate from that of income maximization—problems to be solved by the principles of compensation and taxation.

In holding to this conception of our land tenure problems, Dr. Chryst has questioned the direction of earlier land tenure research because of its large emphasis upon problems of distribution, often, he says, to a neglect of "the more basic objective of economic efficiency." He charges that in our past researches, we have often turned to law and ethics rather than to economics for our guiding principles and tools.

With this conception of land tenure problems, the framework, concepts and techniques commended to us are those embodied in, or applicable to, the economics of the individual farm firm. In this formulation, the land tenure ideal is achieved when all factors are used in their most productive employment and are applied to each possible form of employment, or enterprise, to the point at which value of their marginal productivity is just equal to the marginal costs or worth, of the factors or factor services. As thus conceived, our ideal or end is not a particular form of tenure, but an ideal defined in complete abstraction from property considerations. But while thus defining the ideal, or end to be achieved, the ideal that Messrs. Chryst, Ottoson and Toussaint have subjected to analysis as a problem in tenure relationships is that of an unencumbered owner-operated farm of optimum size and combination of resources. In taking this as their ideal, they have examined the effects of various possible departures from it upon economic efficiency.

The major departures that they have considered are ones that assume landowners providing a fixed quantity of land to tenants who have the capacity and freedom to vary their inputs of labor and capital in such way as to maximize the tenant's income, subject to limitations of the tenure period. Dr. Toussaint, however, has turned his attention to a possible situation in which the major entrepreneurial functions are posited in the landowner and in which the objective is landlord income maximization.

The results postulated as following from these specifically assumed departures from the owner-operator ideal are logically impeccable. In the real world, however, it is highly probable that the landlord might alter his own income by varying his inputs of land relative to the labor and capital commitments secured from his tenants; that landlords have the same desire for income maximization as do tenants; and that they are as able as are tenants to achieve their own personal income maximization. Hence in the real world—especially in the competitive world—it seems to me that instead of the one-sided arrangements analyzed by Ottoson and Toussaint, we are more likely to find both the goal of landlord income maximization and the goal of tenant income maximization at play one against the other in such fashion as will yield results not esssentially unlike those in other competitive factor markets. Of course, to ascertain whether this is so or not, we need to direct our attention more fully to an examination of the nature of the land and labor markets in which tenure arrangements are negotiated than to an examination of merely the tenure arrangements. And in our examination of the latter, instead of categorically ascribing exploitation to particular forms of leasing, we need to be exceedingly alert to possible elements in the lease arrangement and the related resource commitments that forestall the exploitation postulated in our theoretical models, or which compensate for what otherwise would be exploitation or inefficiency. This need is particularly large in localities characterized by competition. Otherwise, we may find ourselves ascribing to tenure arrangements certain apparent inefficiencies that result from such factors as small size of farms, undesirable qualities in landlords or tenants, or a below-normal size of labor force, factors that "cause" both the apparent inefficiency and the tenure arrangement associated with it. Hence, it seems wise that we use such theory as has been commended to us more as guides to investigation rather than as *ipso facto* evidence that particular modes of sharing expenses and receipts result in inefficiency and exploitation.

As I see it, however, the more important weakness in the research approaches suggested to us is to be found in their uses of a conception of efficiency that is independent of income distribution and that in turn is independent of the correlative operation of valuing the services of the resources brought into the tenant-landlord enterprise directly out of their respective holdings. In other words, it seems to be forgotten that the lease arrangement is an operation in the pricing or valuing of factors—some of the factors whose price and returns are to be equated—at the same time that it is an operation in the distribution of income and in the allocation of resources. And until one solves the distribution aspects of this problem and in turn the problem of valuing the respective resource contributions of the landlord and tenant, the efficiency problem is simply indeterminate. Of course, when all farmers are operating under conditions of equilibrium, one can simply take prices as given in the market as a measure of their relative marginal productivities and as measures of their relative contributions to the farming program. But as we consider the problem of leasing arrangements on farms operating far short of the equilibrium position as a step in helping to increase their efficiency, it would be a sheer accident if the relative marginal productivities of factors obtaining in the disequilibrium position should remain the same for the equilibrium position. Yet, if we examine critically the research approaches that have been commended to us, this constancy in relative marginal productivities is by implication what we are told will happen and what we are told ought to happen.

Space and time do not permit either a careful examination of the logical difficulty of a separation of the problems of efficiency and distribution in land tenure problems or an outlining of an alternative framework adequate to these kinds of problems. But research approaches that are directed to the achievement of an efficiency ideal that is conceptually independent of distribution is not land tenure research—at least in terms of my conception of land tenure problems. For the distinguishing feature of land tenure problems is that they are problems foremost of all in the distribution of rights among people in their uses of resources. Hence, land tenure problems are, as earlier land tenure specialists recognized, often ones on which we need to work closely with members of the legal profession. We need, too, to work closely with farm management specialists and to have a good knowledge of production possibilities. But while knowledge of production possibilities superior to the present combination of resources on tenant farms may help to set land tenure problems and may be useful in a solution of them, such knowledge is not in and of itself a solution of tenure problems, not even of the tenure problems it helps to create or to set. It is a well established fact that large improvements are constantly being made in known farm production methods. In much of American agriculture, however, these improvement potentialities are being realized slowly because of the inability of tenants and landlords to work their way through the difficult problems of distribution, joint valuation and organization. These are the essence of land tenure problems and have to be solved before major farming adjustments can be made under tenancy.

Although we ought not to neglect efficiency considerations, surely in our land tenure researches we must continue to place our emphasis very largely upon distribution and joint valuation problems, working toward a conception of efficiency that simultaneously embraces reasonable ideals of equity and social justice as well as reasonable levels of production.

OBJECTIVES OF MARKETING EDUCATION PROGRAMS

(Joint Session with American Marketing Association)

Chairman: Aubrey J. Brown, University of Kentucky

THE PLACE OF CONSUMER EDUCATION IN INCREASING THE DEMAND FOR FOOD*

ROBERT C. KRAMER[1]
Michigan State University

CONGRESS passed the Research and Marketing Act in 1946. In section 203-f of that act an annual appropriation of funds was authorized. These funds permitted states to engage in consumer education work. The stated purpose was to provide effective utilization and greater consumption of agricultural products.[2]

In view of the fact that there are now 90 people working on 67 separate consumer education projects in 39 states, Hawaii and Puerto Rico, it seems quite appropriate to discuss "The Place of Consumer Education in Increasing the Demand for Food."

This paper includes a discussion of four main points. The possibility of expanding the total demand for food is discussed first. Following this there are a few paragraphs on the effect that consumer education extension programs can have on the demand for foods. Then there is a discussion of the implications of a changed demand on producers, handlers and consumers. Finally, there are a few statements on the over-all objectives of extension consumer education programs.

Expanding Total Demand for Food

One difficulty in expanding the consumer demand for food is the inexpansibility of the human stomach. There are few people in the United States who eat less food than they desire. An increased consumption of one food must represent, in most cases, a substitution of that food for some other food. An increase in the demand for food producing resources can occur, however, if low-value foods are replaced in diets by high-value foods. This has been occurring.

Our eating habits have changed substantially since the first World War.

---

* Journal Article No. 1806, Michigan Agricultural Experiment Station.

[1] Acknowledgement is given to Professors J. T. Bonnen, D. E. Hathaway, G. G. Quackenbush, J. D. Shaffer, V. L. Sorenson and L. W. Witt of the Department of Agricultural Economics, Michigan State University for their reviews of an earlier draft of this paper and for their many helpful comments and suggestions.

[2] For a more complete statement see Public Law 733, 79th Congress, Chapter 966, 2D Session H.R. 6932, *Agricultural Marketing Act of 1946*, Title II, Sec. 203(f).

The average individual now eats more fruits and vegetables, more dairy and livestock products and less potatoes and cereals than was formerly the case. Most of the products favored by this shift in consumption patterns have higher unit values than the displaced food items. This trend is indicated by the U.S.D.A.'s price-weighted index of per capita food consumption. Between its 1935-39 base period and 1952, the index of per capita food consumption increased from 100 to 112.

By shifting from low-value to high-value foods, consumer demand for all foods may be increased without any large increase in the physical quantity of foods consumed. The implications of this shifting from one group of food products to another is discussed later.

The second traditional obstacle to expanding demand is the relative rigidity of food expenditures as a percentage of disposal income. However, Loeb,[3] in the latest *Journal of Marketing*, arrays data that indicate that food expenditures expressed as a percentage of disposable income do change over time. Loeb shows that this percentage has varied from a low of 25.4 percent in the depression to a high of 34.3 percent soon after World War II. This percentage fell to 30.8 in 1953. Income and expenditures were computed in terms of 1947 dollars. These percentage changes are related to supply changes or to the relative changes in prices of food and incomes and relative price shifts among expenditure groups as well as to demand changes. The important point is that there is some responsiveness in food expenditures. A small percentage increase can mean many dollars to farmers. If disposable income is 250 billion dollars and 27 percent is spent for food, an increase of one percent means that two and one-half billion more dollars are being spent for food. Much of this increase would be passed on to farmers because of sticky marketing margins.

Many organizations and agencies are attempting to change consumer demands for foods. In general, these attempts are directed toward a demand increase for one group of products (meat) even a subgroup (beef) or a brand.

If we realize that an increase in the demand for all food means that some other expenditure group would be left with reduced expenditures, it does appear plausible to conclude that the per capita demand for food can be increased. The costs would undoubtedly be high—they might well exceed the benefits.

Expanding Demand for Food with Consumer Education

There are important trends in our eating habits due to changing tastes, etc. The cheaper more bulky foods appear to have declining consumer demands. The higher priced usually more nutritious foods seem to have

[3] Benjamin S. Loeb, "The Use of Engel's Laws as a Basis for Predicting Consumer Expenditures," *The Journal of Marketing*, Vol. XX, No. 1, p. 20.

increasing consumer demands. Extension consumer education programs may be able to focus attention to existing trends. These programs can probably not reverse trends or materially alter those that are underway.

A sound consumer education program must be tied to reliable information on nutrition. Consumer education about nutrition may induce consumers to place a higher value on food. The demands for some foods may be increased. This assumes that the effective demand for food rests on nutritional considerations. Many feel that social and cultural conditions are more important.

It should be mentioned that information on nutrition may induce consumers to reduce the consumption of some foods. This would mean that the consumption and the demand for these products might decrease.

Pickrel and Witt[4] of Michigan State University studied the changes in physical food consumption that could be expected if each group of consumers moved up to the next higher income level. This study has practical implications in view of our constantly rising standard of living. Seven income levels were used in the computations. They began at under $1,000 and increased to $5,000 by increments of $1,000. The other two income levels were from $5,000 to $7,500 and $7,500 and up. Their conclusions were:

1. Aggregate consumption of green and leafy vegetables; eggs, meat, poultry and fish; and dairy products would increase by 4.8 to 6.6 percent.
2. Aggregate consumption of tomatoes and citrus fruits would increase by 11.5 percent.
3. Aggregate consumption of another group designated as "other fruits and vegetables" would increase by 10.1 percent.
4. Aggregate consumption of sugar and syrup would not change.
5. Aggregate consumption of potatoes; sweet potatoes; butter, fats and oils (as a group); flour and cereal products; and beans, peas and nuts would decrease.

These data indicate that consumption patterns have changed and are expected to continue to change if incomes continue to increase and four major assumptions hold. The four major assumptions are: (1) that low-income families do prefer to change consumption patterns; (2) that the 1948 patterns of consumption do represent the patterns of relationships of a full employment economy; (3) that the "new rich" will consume as the "old rich (which is probably not perfectly true); and (4) that relative prices will not change. If incomes rise, other things being equal, prices will rise also and the full extent of these indicated shifts will not materialize.

---

[4] Luther Pickrel, and Lawrence Witt, "An Exploration of Possible Increase in Food Consumption," *Quarterly Bulletin*, Michigan State College, Vol. 37, No. 1, pp. 27-34, August 1954.

Two of the major demand shifters (changing food wants and changing abilities to purchase food) have been mentioned. A third is the increasing population in the United States. This demand shifter is important but not considered in this paper.

The prospects for a noticeably expanded demand for food do not appear bright as a result of the efforts of only 90 people in consumer education work. Potentially, these 90 people working with other extension agents, particularly home demonstration agents, form a much more powerful team than when working alone. In many states consumer education agents already work very closely with home demonstration agents. They also work closely with radio, television and newspaper personnel. Actually, then, the force is much larger than 90 people.

These extension agents provide not only nutritional information but also information on commodities in season and high in quality. Nonnutritional information probably is given more importance in programs and releases than the pure nutritional information. Seasonal information on commodities could conceivably increase the demand for seasonal products. Markets for local products could be expanded and stabilized by seasonal information.

Many studies have been made that indicate that the price elasticity of demand for all food is inelastic at the retail level. Economists debate the exact numerical value but all agree to the inelasticity. This "all-foods" bundle is made up of many individual foods, some with demand elasticities well below unity and others well above.

It has been suggested that consumer demand for foods with elastic demands (price) can be shifted to the right more easily than can the consumer demand for foods with inelastic demands. Much hard thought needs to be given to this. The possibility of increasing the demand for food through consumer education depends largely upon the existence of unrecognized consumer wants for these foods.

One can find in the literature that an increase in the demand for one food is usually associated (except for complements) with a decrease in the demand for another food. The conclusion usually inferred is that agriculture in the aggregate will be no better nor no worse off after an increase in the demand for one food. The final status of agriculture depends upon the elasticity of substitution and the profitability of the production of the two foods involved.

Data from the Michigan State University Consumer Panel indicate that individual families do vary their weekly and monthly expenditures for food. However, it has been found that increased expenditures for some families are usually balanced by decreased expenditures for other families.

Implications of Consumer Education Programs

If consumer education programs were effective in shifting the consumer demand curve for all foods to the right, producers in the short run would gain. In the long run higher commodity prices might call forth greater supplies and commodity prices would thence fall, but probably not to the original level. There would probably not be more than a short-term gain for farmers using these assumptions of increase in supplies following the increase of commodity prices. The short-term gain depends upon the extent of the shift of the supply schedule.

Consumers would spend more for their food supplies in the short run following the increase in demand (shift of curve to right). In the long run consumers would not spend as much more. Consumer satisfactions would be increased in both the short and long run. Consumers would not have had increased demands if they felt they were not obtaining greater satisfactions. Consumers, therefore, would have a net gain in both the short and long run.

Marketing agencies would be expected to gain if there existed economies of scale. They would have a gain even if they operated on the same margin per unit.

The above discussion has assumed that consumer education has increased the total demand for food. This assumption is not realistic. A more realistic assumption is that consumer education will enable the consumer to adjust to a higher standard of living. Under this assumption the demand for all foods need not increase. The demand for some foods, even high-valued foods, may very well decrease. We may reasonably expect present trends to continue. The demand for the cheaper, bulky foods may continue to decrease, although new product uses and other innovations could alter trends for particular commodities.

The majority of the consumers could be expected to gain from this type of consumer education program. The only consumers who would not gain are those who are competent to judge nutritional needs and who have sufficient information to maximize satisfactions without the aid of publicly supported consumer education. In fact, if consumer education specialists point out this information to all consumers in their areas, it could be assumed that increased demands, for the "good buys" and the nutritionally desirable foods would cause prices to rise and the competent group would lose to the extent of the price rise. It seems safe to assume that many more consumers would gain than would lose. All consumers would lose to the extent that their expense in tax dollars paid for the public service was not offset by gains in satisfactions.

With the demands for some products increasing and some decreasing, marketing agencies would gain or lose according to the products handled

and the changes occurring for these products. Some handlers would experience gains and no losses. This assumes they handle only those products having increased demands. It is likewise conceivable that some handlers would experience all losses and no gains. On balance it appears that the gains would outweigh the losses.

Consumer education can be expected to increase marketing efficiency. An increase in marketing efficiency would help some handlers. As marketing efficiency increased, some firms would be able to handle a larger volume of business. This would slow down the growth in the number of new firms or cause less efficient old firms to stop doing business.

If we assume effective competition, increases in marketing efficiency could mean net price reductions to consumers. Consumers in this case would gain. Increased supplies would be called for, and in the short run producers would gain. Producers would also gain in the long run if the effect of this is a total quantity supplied that has not increased as much as the quantity demanded.

In case of short and long-run effects of increases in demand for all foods, one would conclude that all farmers would gain in the short run. If increased prices did call forth increased supplies in the long run, farmers would probably be better off than before the increase in demand. They could be better off or worse off. The response farmers will make and their subsequent status is determined by the elasticity of supply and the shift of the supply schedule.[5]

Increasing demands for some foods and decreasing demands for others gives another story. Those producers whose products are favored by the increased demand would gain. The other producers would lose. Since most consumers will gain from consumer education programs, producers will gain to the extent that they are also consumers. Thus, for the fortunate farmers there will be a double gain. For the unfortunate farmers there will be only the gain as consumers. This gain may not offset the losses sustained as producers.

Increases in marketing efficiency that reduce marketing costs and consumer prices may call forth increased supplies. Producers may gain in this case. A reduction in waste is equivalent to an increase in supply. The reduction in waste and the subsequent effect could offset the gain to producers caused by an increase in marketing efficiency.

It is impossible to quantitatively assess the many facets in this problem. On balance, many producers will experience short-term gains from consumer education programs. In the long run the supply response will determine whether producers gain or lose.

[5] It is assumed that the increase in demand will not cause new production technologies to be employed at a faster rate than before the increase in demand.

Objectives of Consumer Education Programs

If consumer education extension programs will not increase the demand for all foods, should they be continued? If consumer education will only expedite trends, why spend good dollars for these programs? These and many other questions can be asked. What is the real purpose of extension consumer education programs? The discussion that follows is an attempt to answer this last question.

Agricultural extension programs are educational programs. Therefore, extension consumer programs should be primarily educational in nature. Consumer programs, like our other extension programs, are designed to change people's tastes, beliefs and attitudes. These changes will affect their actions. Extension administrators hope these actions are for the better. Actions regarding food purchases may be beneficial or detrimental to farmers. With consumer education, consumers may feel that overconsumption is more of a problem than underconsumption. A reduction in consumption would not be helpful to the producers of the particular foods that experienced the reduced consumption.

For years extension administrators have felt that extension agents and specialists have been able to reduce the cost of learning for individuals below the figure required if the individual obtained the information for himself. They have also believed that extension agents and specialists have speeded up the adoption of new technologies. These, too, are primary goals of consumer education.

How further to enjoy our rising standard of living is important to the majority of us. We want to maximize our satisfactions. Well-trained consumer education personnel can help consumers enjoy life and be healthier. Also homemakers want information relative to providing nutritious diets for their families. They also like suggestions for variety in their meals. There are many homemakers who have not been effectively encouraged to try new or different foods. Good eating is fundamental to the good health that everyone strives for. A wide variety of foods may be basic to enjoyable eating. If homemakers will study cook books, go to night schools and swap favorite recipes, we know that good eating and good cooking mean much to them. Consumer information will be used if it provides suggestions in an attractive manner.

There are currently underway changes in consumption patterns. Consumer education specialists may speed up some of these changes by providing consumer information. Scitovsky[6] has a discussion pertinent to this point. He states that "The average consumer has fixed consumption habits,

[6] Tibor Scitovsky, *Welfare and Competition*, Chicago: Richard D. Irvin, Inc., 1951, pp. 48 and 49.

which he has acquired on the basis of past price constellations; and it takes time for a changed price to break an old habit and form a new one. When relative prices change or new opportunities arise, the consumer usually continues in his accustomed grooves for awhile, because he needs time to learn about a change, to appraise its significance, and more time to adapt his behavior to it and face the inconveniences or hazards that changing one's behavior often involves."

Consumer education specialists are continuously watching food prices. One of their major tasks is reporting relative price changes and appraising the significance of these changes to consumers. This information should enable consumers to make rational decisions in a shorter period of time. Scitovsky goes on to state, "The time lag with which the consumer adjusts his market behavior to a changed market situation depends on a variety of factors, among which the consumer's information or lack of information is perhaps the most important. An informed person, knowing the merits of alternative offers, will be quick to profit by a price reduction or to adjust his behavior to a price rise. An uninformed consumer, however, has to rely on habit and past experience to a greater extent and will feel his way slowly and cautiously toward trying out a new brand of a commodity or otherwise adjusting his behavior to a price change."

With consumer education programs there is a two-way channel for information. Not only can information be spread to consumers but consumers have in the consumer specialist a person to contact who is in a position to transmit to marketing people and farmers their likes and dislikes. Maybe the consumer continues to purchase fat pork chops, Robinson strawberries or Elberta peaches even though she prefers lean pork chops, Premier strawberries and Hale Haven peaches. Traditionally we have relied upon the price system to flash the warning signal to the producer of products with declining demands. The price system has not worked perfectly. Now, we have the price system and the consumer education program to supplement one another. Consumer education specialists can help express in words what the consumer likes or dislikes. Price increases or decreases do not indicate the reason for the change; just the direction of the change. It appears, therefore, that pricing efficiency is helped with consumer education programs.

Operational efficiency in marketing can probably be increased by consumer education programs. By directing attention to seasonal supplies of food products consumers will be encouraged to make purchases when supplies are large, quality is high and prices are relatively more favorable. Thus, consumer information should enable marketing agencies to move seasonal supplies into consumer's hands more efficiently than with

no consumer education program. Calling attention to products that are in cyclically large supply should also help both consumers and marketing agencies because prices are relatively more favorable.

Many consumer education specialists devote a part of their energies to the dissemination of information on how to choose, how to store, and how to prepare foods. Teaching consumers how to select food products in the retail store should reduce breakage and waste in the retail store. With less breakage and loss the retailer should be able to merchandise foods at a lower cost.

The new technologies facilitated by consumer education may be of several types. They may be product saving, time saving, market-cost decreasing, market-cost increasing, etc. Frozen concentrated orange juice is probably product saving. More good tasting orange juice can probably be marketed from a given unit of oranges when the juice is concentrated and frozen than when marketed in any other form. Retailing prepackaged meat probably saves labor costs for the retailer and shopping time for the food shopper. Prefabricated meats used by institutions are time savers. These examples may also be market-cost increasing or decreasing technologies. Frozen concentrated orange juice is probably a market-cost decreasing technology. Precooked frozen dinners are probably an example of a market-cost increasing technology. With the exception of the case where product-choice opportunities are reduced, all of these new technologies increase satisfactions for consumers.

Summary

Even though it appears possible to increase the total demand for food, this is not likely to happen as a result of extension consumer education programs. Even if consumer demand for all food cannot be increased, extension consumer education programs have a valuable place in our extension service.

Extension programs are primarily educational. Consumers appreciate and will undoubtedly support consumer education programs that help them make rational decisions that more nearly maximize their satisfactions. Trained consumer education specialists can probably provide information for decision making at a lower individual cost than an individual can provide for himself. These specialists can also speed up the adoption of new technology in nutrition and marketing.

Farmers generally can expect to gain as consumers from consumer education. However, some farmers may lose as producers if consumption trends continue or if consumers decide actually to reduce food consumption. Many product producers will undoubtedly gain from consumer education.

To be continued and expanded, consumer education programs will probably need to have consumer support. Advisory councils appear to be one way that this support can be developed. Only sound programs that are consumer oriented can be expected to receive consumer approval.

Only 90 consumer people are now working in extension consumer education projects. These 90 people must be constantly striving to present useful, timely and correct information to consumers. They can develop a valuable service for consumers.

THE PLACE OF MERCHANDISING AND PROMOTION IN EXPANDING THE DEMAND FOR FOOD*

R. L. KOHLS[1]
Purdue University

MANY of the various agricultural associations are pleading with their members for more promotional funds. Our current research literature abounds with studies of different sized packages, different display techniques, different store arrangements, etc. A wide-spread feeling seems to be abroad—often aided and abetted by officials in very high places speaking before all types of groups—that agriculture could solve its problems if it would only promote and properly merchandise its products.

The terms "merchandising" and "promotion" have different meanings to different people. In order to avoid dogmatic definition, let us first consider the various decisions and activities that would be involved in accomplishing the selling job in our contemporary economy. A partial list would include:

1. The choice of the product form such as fresh, canned, frozen or perhaps dried concentrate orange juice.
2. The decision as to the appropriate marketing channel and agencies to be used such as direct salesmen, or independent wholesalers and brokers.
3. The efforts to control the product as it moves from producer to consumer as to amount, timeliness and quality.
4. The decision as to brand differentiation policy.
5. Decisions as to pricing policies.
6. The point-of-sale activities such as packaging and displays, and store and product arrangements to secure maximum consumer acceptance.
7. Advertising through the various communication media aimed at influencing the choice of either handlers or consumers.

In most instances the references to "promote and merchandise properly" refer only to the point of sale activities and the advertising budget. These activities are only a part—and often a small part—of a coordinated selling effort. However, attention will be restricted to these rather narrow concepts of selling.

First, the goal of these activities is to increase demand. Many times one gets the impression that increased consumption is the goal. For example, a leader in the cattle industry in advocating additional promotion was quoted as saying, ". . . I can't do anything about the price of beef . . . but I might be able to do something about increasing the consumption of

---

* Journal Paper No. 895 of the Indiana Agricultural Experiment Station.
[1] The author wishes to express his thanks to his colleagues Professors J. W. Wiley, R. L. Stucky, V. W. Ruttan and R. B. Wilson for their critical help in preparing this paper.

beef."[2] Obviously in the agricultural area where we tend to eat what we produce when the pricing system is left relatively free, the aim is to move the present amount at higher prices or prepare the way for moving future increased amounts at stable prices. Consumption alone is not the goal.

Furthermore, the major goal of such activities undertaken by agricultural groups is not to expand the level of consumer demand for food, but rather to expand the farm-level derivative of this demand. An increase in the consumer-level demand for food does not *per se* necessarily result in a similar shift for the farm product. Secretary Benson, in an appearance before a potato growers' group, is quoted as saying, "To-day's homemaker wants eye-appeal—how can we help provide it? She wants convenience, how can we help provide it?"[3] These questions do not go far enough. Additional values can be added to the food package finally purchased by consumers. If such efforts are to be successful from the initiator's viewpoint, however, consumers must be willing to pay something more than the costs involved. The advertising and promotional activities are not costless. And if they are to be judged successful by their sponsors, consumers must be persuaded to make increased outlays greater than the costs.

In evaluating the results of these activities, three levels of judgement can be recognized:

1. How effective are such efforts in changing the demand for *whole aggregates* of products—such as food, clothing, electrical appliances, etc?
2. How effective are such efforts in changing the demands for a *general type* of product (often called primary demands)—such as dairy products, men's hats, refrigerators, etc?
3. How effective are such efforts in changing the demands for the output of the product of a *particular seller* (often called selective demands)—such as Borden's milk, Adam's hats and Philco refrigerators?

The potency of the tools of promotion and merchandising to influence demand increases as one moves down from the aggregate to the specific. I do not believe that careful, objective analysis will show these promotional tools to be strong enough to increase the *total* farm-level demand for food. In the aggregate we are a wealthy, well-fed people. The cross-elasticity of demand between food products and nonfood products is very low. To reason that one can shift this complex relationship of two diverse families of products is crediting more potency to these tools than would most advertising executives. In fact, most such efforts will gain

[2] Jay Taylor, "Some Nutritional and Economic Benefits which Can Be Gained by Doubling Beef Consumption in 10 Years," *Western Farm Economics Association Proceedings*, July 1954, pp. 18-21.

[3] Press release of Secretary Benson's speech before the Kern County Potato Growers Association, Bakersfield, California, March 22, 1955.

their success at the expense of products closely related in the revelant family of substitution. And in the case of food this will mean other foods. But this may not be just a simple exchange of business volume. The adversely effected groups may retaliate with their own promotional expenditures. The end result may well be added marketing costs to be subtracted from the total consumer outlay, which may be either no greater or just enough greater to cover the added costs. We are back again to the proposition that a shift in the demand for the consumer-level food package may have no relevance to the level of demand for the agricultural raw products.

But money on advertising and merchandising will be spent. Broiler growers, turkey growers, milk producers, cattle raisers, prune growers and so on across the agricultural scene will be pressured continually to increase their contributions for promotional efforts. Thus, the question must be answered as to how such expenditures can be made most effectively.

Unfortunately many of our agricultural groups have been led to believe that very little money has been spent promoting food and that any promition expenditure will return itself many fold. They have been fed on large doses of salesmanship by the advertising trade itself. From some of the glittering success stories of the advertising of manufacturing concerns, they have generalized that such success is theirs for the doing. Of course, in nonagricultural industry very successful concerns are always asking how much and what kind of promotion is profitable.

First it seems that we must reject the oft repeated statement that food is not advertised and promoted. Of the 100 leading advertisers (spending two million dollars or more each) in 1954, 21 were food-product concerns spending a total of $137.4 million. In these 21 were six cereal-bakery accounts, two meat accounts, two citrus accounts, five dairy accounts and six general food-product accounts. This total does not include the newspaper expenditures we all recognize are huge. But generally, there was one essential difference in these efforts as compared with efforts by our agricultural groups. These firms were promoting their particular brand of product (selective demand efforts). Most agricultural groups find themselves promoting such general lines as turkeys, chickens, milk or cherries (primary demand efforts).

What are the criteria that students of the problem usually use to predict the success of an advertising venture? These can be listed as follows:

1. The product should be one that has a favorable demand trend. Many of the outstanding success stories of advertising are found in those situations in which the expansion of demand was already underway. The literature seems relatively void of accounts of advertising successfully reversing an unfavorable demand trend.

2. The product should have a large chance for successful differentiation from its potential substitutes. Successful differentiation usually depends on two things: (a) consumers should attach greater importance to hidden or undeterminate qualities of the product than to external qualities that can be readily seen and judged, and (b) rigid control should be maintained over the product to see that the stressed qualities are the same at any time or place.
3. There should be powerful emotional buying motives employed.
4. A substantial sum of money must be available if mass media efforts are undertaken. Small resources do not necessarily give limited results while increased resources greater results. Rather, limited resources poorly spent may actually mean an "operation rat-hole."
5. Promotional efforts must be coordinated with the other selling activities presented earlier. One advertising expert has said that advertising itself does not sell, it merely creates traffic so that selling can be done.

We can best see the importance in the above criteria by examining the results of some actual promotional ventures undertaken in the past. The objective evaluation of the results of promotional efforts is very difficult indeed. Obviously some haphazard consumption data (which in agriculture often measures only production success) or elaborate detail on how many lines or words were thrown at how many millions is not enough. What is needed is for all other variables to be held constant while only promotional efforts are varied. But other factors are not held constant. With the effect of changing technology on supply, the competitive relation with other products change. Distribution practices, quality, incomes, living habits and attitudes may change with resultant effect on demands. Neil Borden[4] has undertaken such evaluation. Although the time period of the analysis was the decades of the twenties and thirties, the results still illustrate the potentialities and limitations of promotional efforts:

The Tobacco Industry gives us a good example of both the inability to affect the aggregate tobacco demand and the importance of having a favorable demand trend. The members of this industry have expended huge sums for promotion. In the relatively unprosperous year of 1939, traceable expenditures were estimated at from 55 to 60 million dollars. The study concluded:

a. It did not appear that these heavy expenditures had been adequate to expand for the total over-all tobacco demand.
b. Advertising had been a factor in expanding demand for cigarettes and a factor in building consumer brand preference.
c. Advertising may have been a force in slowing adverse demand trends for cigars and smoking tobaccos, but it was not a force strong enough to reverse the declining demand trend. Advertising appeared to have been a force in brand selection.

[4] Neil Borden, *The Economic Effects of Advertising* (Irwin, Chicago, 1942).

The Sugar Industry illustrates the difficulty of working with a relatively nondifferentiated product. Advertising expenditures ranged from $200,000 to over one million dollars annually. The study concluded:

a. Advertising was not an appreciable factor influencing the expansion of sugar consumption.
b. Advertising by individual companies had little effect in guiding selective brand demand. There evidently was not enough differentiation to lead the consumer to pay a price differential for particular brands.

The Orange Industry headed by the California Fruit Growers Exchange expended large sums for promotion (averaging over $1,000,000 annually during 1930-39). The study concluded:

a. The ever-increasing volume of oranges were not moved without price cuts. On the other hand, the large crops probably could not have been moved with the price concessions made had not the consumer's desire for oranges been increased over the period.
b. In properly evaluating the orange situation other factors besides promotion must also be kept in mind. The association established and maintained a very stringent quality control under their brand. A large force of direct salesmen were employed to work with the trade. Some regulation over supplies in different markets was practiced. And finally, very favorable dietary and cost trends were underway during the period.

The Lettuce Industry was studied as one for which there was no organized advertising expenditures. It, similar to oranges, had a remarkable expansion in demand during the period studied.

The Walnut Industry spent from 2.2 to 11.3 percent of the annual farm value of the crop on promotion during the period of analysis. The study concluded that no clear-cut answer as to the effect on net returns to growers was possible. It suggested, however, that the advertising expenditure may have returned its worth by providing an aggressive management with a helpful weapon to force aggressive efforts of its broker and dealer organization.

In addition, two other case histories might be cited as illustrations that promotion success depends upon its integration with other marketing actions.[5] One of these situations also involved the Walnut Growers Association. In this instance the growers were faced with a very large post-holiday carryover of supplies in the hands of brokers and retailers. Although not of direct concern to the Association, such supplies hung over the next year's crop. The Association allocated $125,000 for an emergency job. The effort was pin-pointed on a pre-Easter movement emphasizing the off-season availability as an *unusual* event. Advertising was beamed at

[5] Editors of *Printers Ink, Case Histories of Successful Advertising* (Funk and Wagnalls, New York, 1949), Ch. 27, 56.

the consumer and at the trade. Brokers and salesmen cooperated. The trade made substantial price reductions since they were the ones immediately involved. The large inventory was moved in an orderly manner. All groups apparently were quite satisfied.

The other case concerned the cheese promotion of the Tillamook County Creamery Association of Oregon. The Tillamook brand evidently had been able to command premium prices. There were other ingredients, however, than the advertising campaign itself. Advertising was just one part of a coordinated program that included (a) product differentiation through the establishment of a brand, trade-mark and slogan, (b) very rigid quality control and (c) a closely supervised distribution system to assure the maintenance of that quality through to the consumers.

What can be concluded from this discussion that might be useful in our work in this area? There are both positive and negative conclusions:

1. Promotional efforts of agricultural groups that are aimed at the general goal of influencing primary demand such as that for beef, dairy products, poultry, etc., appear to have very limited success potential. Study will show very little of this type of advertising being done by industry. Some trade association promotion, such as for the American breweries or railroads is done, but the purpose is usually to create good will for the industry. In speaking of potential effectiveness of this type of promotion, Borden after his study concluded, "One clear and important generalization can be made, namely that basic trends of demands for products which are determined by underlying social and environmental conditions are more significant in determining the expansion or contraction of primary demand than is the use or lack of use of advertising."[6] This does not say that these demands cannot be influenced but rather that promotion is a poor tool to do the job. Groups may be well advised to reduce their television and magazine budgets in favor of work on such things as product development, retail and wholesaler training, and product standardization.
2. Selective promotion based on brand alone may have very limited use for most agricultural groups because of the inherent difficulty involved in securing meaningful product differentiation. However, there are specific aspects of the products of agriculture that can be singled out as the basis for specific promotional efforts. Supplies and prices are the principle variables in agricultural products. Consumer knowledge of these is often limited or too late. Properly timed promotional efforts could be used to bolster our informational system. Nutritional and use values of products often are not fully known. In some instances, inaccurate and detrimental opinions are held by consumers. New types of products may be introduced in which widespread and rapid dissemination of information is desired.

   Successful efforts would pin-point the area of unusualness or misinformation and then hit with a *coordinated* program that includes promotion as one of its several elements. In other words, not a campaign to "eat more beef because it's good for you" but rather "eat beef now for supplies

[6] Neil Borden, *op. cit.*, p. 436.

are heavy and prices are very reasonable." A campaign "to eat an egg now and meat later" might be rather barren of results. On the other hand, a program to inform the consumers that small eggs can be of high quality—a known point of misinformation—and are good buys has more of the ingredients for success. Even in these instances, the large expenditure necessary for a promotional campaign through radio, newspapers or television might well be better utilized by backing consumer education efforts or by direct work with wholesalers and retailers.

3. Although our attention has been focused mainly on advertising efforts, not all work on merchandising activities such as packaging, displays, etc. has the same effect on farm-level demand. A new form of packaging helps sell more of a given product in store "A." Ours is an imitative society in which firms quickly adopt those things that gain new business. The relevant question is what will be the effect on demand after all stores have put this product in certain sized packages or displayed it in a certain way? Will consumer satisfaction be increased so that she will pay more than enough to cover the extra costs? Does the new technique permit a better use of resources so that marketing and processing costs are lower? Or is the technique one, which when widely adopted, results in increased marketing costs to be subtracted from substantially unchanged consumer outlays?
4. In fully evaluating these efforts other considerations need be explored. If merchandising innovation is the real essence of modern competition, continual stirring of the pot may be one method of maintaining effective competition. This may also be the principal method of encouraging the reduction of firms in sectors where the scale of operation is disadvantageous. The maintenance of informed consumer freedom of choice is of great importance. The current battle between discount houses and convential retailers points up that consumers may just not continually want more convenience and more service at any price.

The emphasis on marketing is rapidly pushing those of us in agricultural economics farther and farther from the farm basis of our orientation. It is our increasing responsibility to be able to give sound answers to issues such as these raised here. Our unfamilarity in these areas often has led us actively to push—or passively permit pushing—efforts with restricted potentials as panaceas for our problems. The real challenge to most of us agriculturally oriented is to educate ourselves and broaden our viewpoints.

PREDICTING MARKET ACCEPTANCE

TRIENAH MEYERS
Agricultural Marketing Service

IT IS getting more and more important for us to be able to predict our markets. The agricultural economy has grown so large and so complex that it is almost impossible to make important decisions out of "personal judgment" alone. The consumer no longer meets the producer in the market place to accept or reject products and to discuss satisfaction or complaints, and the gaps between consumer and producer continue to widen. Even in the retail store, the final distribution point, there is an increasing impersonality. The growth of large self-service stores with the trend toward prepackaging now provides a situation in which a consumer can select a week's supply of food and never speak to a clerk—either to express pleasure or to complain about available merchandise. In the textile field also, particularly in clothing, the trend toward self-service in the larger stores is growing. In smaller stores too, retail clerks are often ineffective in communicating information either to customers or from customers back to management.

To market efficiently, we need to know what we are selling and why we sell it, and, negatively, why we fail to reach certain markets. We need to know the relationship of our sales to those of our competitors—sometimes the relationship of one agricultural product to another—sometimes the relationship of an agricultural product to a nonagricultural product. We need to know what it takes to launch a new product—what we must do in advance to assure ourselves reasonable success. In our large scale operation, one that involves a $50 billion marketing structure, mistakes cost too much and affect too many levels of the economy.

We have come to the stage when we must take stock of what we are doing in the area of predicting agricultural markets. Agricultural economics is not unique in its need for prediction. Workers in nearly all social science research are trying to understand the present so they can predict the future. In many ways, indeed, marketing specialists in agriculture are doing a better job than those in other fields in increasing skills. We are moving across discipline lines searching for new techniques. But, as we do this, we have to be acutely aware that an entire problem can seldom be solved completely with a single approach and that different techniques almost always measure slightly different aspects of the problem.

In the last few years—whenever there has been a discussion of technique or research design—we hear a growing furor over semantics. What is prediction? Must it be for an indefinite future, or can it be a forward-

backward view that permits an understanding of the present? What is acceptance? What is preference? Must a consumer have experience with a product before he is permitted to express a preference?

It would be comfortable if everybody used words in the same way, but this is more than can be expected. Anyway, this to-do over definitions is not constructive. If a research worker defines what he is trying to measure, explains why he thinks these measurements shed light on his problem, and includes a full description of research method, that is enough for any reasonable person.

For purposes of this discussion, I would like to use the word preference to mean an expression of wanting an attribute or a product—or a ranking of one attribute or product over another. In preference analysis we are looking for stimuli—for the reasons behind preference—for the influences that provoke desire or behavior. In acceptance we are watching and experimenting with what an individual does when confronted by certain stimuli.

Those who come into agricultural research from the study of man and his institutions in the psychological and sociological framework wish to add to the understanding of marketing. We feel that we can contribute something through getting at reasons behind what happens in the market. We know that many influences affect consumption besides price and income relationships. For old products, we can often catch storm warnings before they show up in backed-up inventory either because the product itself has lost quality or because a competitive product has come closer to satisfying the consumer. For new and untried products, we can do reconnaissance work. We can find out whether or not consumers feel—at least on a conscious level—that the new products are distinguishable from other products; whether they would consider buying them; whether they respond to flaws that designers and technologists overlooked.

Most research devoted to predicting markets falls within these 5 major categories: (1) Studies of aggregate production and consumption; (2) studies based on retail store records and retail store experiments; (3) panel research; (4) direct interviewing; and (5) motivation research. What can studies in each of these 5 major groupings be expected to do? What limitations do they have?

Studies of *aggregate* production are useful in understanding the market and, eventually, in learning to do a better job of guiding the economy. We must have descriptive studies of the past before we can go on to an understanding of the present and a forecast of the future. We can work with aggregate figures any place along the marketing channel—from actual production to any one industry absorbing some of our agricultural commodities and on through to the final consumer. Average per capita so

calculated can give us a picture of trends and the average quantities of commodities that individuals have used. Trends are often interpreted as indicative of changing preference, but such inferences are open to question. Too many questions show up in our consumption curves that go unanswered. Per capita figures so derived include all persons or units, regardless of whether they use or do not use the commodity. The figures give no indication of the characteristics of users or of nonusers. They can show, over time, what consumers are taking from the market and we can chart such data on graphs, along with any other characteristics of the nation which we feel might have a relationship to the particular consumption figures we have. They provide good background data, but they leave to hypothesis the reasons for the changes that have occurred.

Another large group of studies are those based on *retail store* records or retail store experiments. Records are kept of day-to-day sales, prices paid by customers, and inventory. Comparison of relative quantities of different products sold, or of relative quantities of one product in different forms, is then used as a basis for inferring a preference of the buying public or their future acceptance.

Under a given set of conditions, such studies can furnish reliable indicators of the movement of goods and their selling prices. They are excellent in their way, but they usually have some practical limitations. The sample of outlets should be representative of all outlets through which a particular product is sold. The cost of meeting this requirement is often prohibitive or the objective impractical of attainment because of impossibility of getting the consent of particular outlets. Even with an effectual sample, there must be constant and complete cooperation between management of all the sample outlets and those who direct the research, for the full duration of the study.

Then there is the practical limitation of time, particularly with reference to the experimental situation. We can seldom run our studies long enough to know whether the same results would obtain over time after the effect of newness wears off or after additional stores undertake the same merchandising techniques. The findings cannot provide a full understanding of the "whys" behind consumer action.

In favor of this method is the argument that it deals with objective data and therefore is superior to subjective responses to direct questions. It does provide a fine opportunity to test, in applied situations, whether hypotheses developed either out of our own imagination or from consumer studies really will serve as effective techniques in the market place. This method has a real function, but we who use it should be neither tricked by its apparent simplicity nor misled into making unjustified inferences from the data it affords. If, as in the case of other methods, its

limitations are kept in mind, it can produce valuable information.

The reporting *panel* is another device that has been used for some time in the social sciences. The panel method usually provides a sensitive measure of change and it may be specifically designed for particular problems. It can be a measure of amounts of food or fibers disappearing into the consumer unit, or it can be used as a basis for continuous interviewing on subjects which are alive at a given moment. We seldom combine both record keeping and personal interview in any one panel because of our concern about bias. A consumer panel is an expensive operation; it requies constant and expert administration.

There is considerable doubt that a continuously reporting panel can ever be truly representative of the universe that it is supposed to depict. Persons who refuse to participate introduce an initial bias. Even when they are replaced, the fact that the replacement members do agree to become members may perpetuate the original bias. As time goes on, more and more members drop out and cause increasing lack of representativeness. Drop-outs must be replaced to keep the panel up to strength and this again operates to produce some bias. Many panels have shaken down to as few as a third of their original members. Even though replacements may match drop-outs in personal characteristics, the fact that they are willing to assume the responsibility of regular reporting may in itself seriously differentiate them from those who dropped out.

The act of record keeping itself introduces another source of bias, as panel members become conditioned by particular items in a recording diary. Material collected from panels of the record-keeping kind ordinarily furnishes no data for the analysis of buying motivation or the effect on behavior of specific information or of misinformation about the product.

Although panels are fine indicators of trends and can give quick warnings of change in consumption and provide a full description of the personal characteristics of those who use and of those who do not use specific products, they usually provide no knowledge of why there are nonusers of a product. That is why they cannot be used as a source of ideas on how to attract an untapped or a lost market.

The *mail survey*, an extremely popular device, is relatively inexpensive and can reach a large sample. It can be done quickly and the results become available in a short time. It is a valuable tool in many areas of economic research. Particularly in certain industrial studies where industry interest is high, mail studies have been a reliable source of certain objective data. In consumer studies, however, the rate of response is often so low as to result in serious sampling bias.

Another defect is the fact that in many studies persons who will answer

mail questionnaires are different from those who will not; the consequent loss of representativeness is obvious. In addition, only a few questions can be asked in a mail questionnaire, and most of them have to be a simple check-off type. The method has limited usefulness in studies of wants and behavior and it is not an adequate tool for the study of attitudes and reasons for likes and dislikes. But anyone who needs limited data quickly can use certain tricks to make a mail survey effective. To overcome nonresponse, the surveyor can use a series of mail reminders plus a personal interview with a subsample of the final hold-outs. The results of each wave can be tabulated separately and projected to the total. This is, of course, a nice statistical device but it isn't adequate to cover lack of data. Yet, it is often the only device that can be used under certain limitations of time or money.

Next, *the personal interview.* Although initial cost often seems high, outlay per item of information obtained is usually extremely reasonable. This method can provide a long list of different kinds of information—information on use and nonuse, reasons for behavior and likes and dislikes, levels of information regarding products and factors motivating buying and nonbuying. It can provide information about different phases of marketing, attitudes towards types and sizes of packages and toward different methods of merchandising, quantities bought or used during a specific period, and frequency and recency of use. Another use is in conducting practical field tests of the results of laboratory experiments on the ability of consumers to distinguish between product characteristics. This method also can establish the psychological scale of relative preference. When it is well planned and properly administered, the method can produce answers from more than 90 percent of the original sample and thus reduce to a minimum one of the worst sources of bias in other methods that depend on sampling.

But here, too, the user is not to be trapped by apparent simplicity—the fact that it seems easy to think up a question. The most minor variation in wording a question can introduce a major change in answers. The presence or absence of a parenthetical explanation introduces differences, and the use of certain words can increase the "yes" or the "no" answers to a seemingly simple question. The attitude of the interviewer can increase or decrease the fullness of the answers.

Although more and more demands are being made on the interview survey, it is a tool to be used with caution.

Last but not least, *motivation research.* This method actually has its background in clinical and psychiatric work, with a great boost from ad-men. We are all working on motivation problems. That a particular set of psychiatric tests should have come to be called motivation research

is the result of the work of a few psychologists and many journalists. Motivation research makes good copy; clients are beginning to demand it even when they don't know what it means. So far, it is experimental; it is a fine source for ideas. Many of the really good motivation research people are unbelievably ingenious. But, so far, it has not developed to the stage at which its statistics are acceptable, when two people faced with the same data come to the same conclusion, and the method can be replicated.

To emphasize the need for studying marketing problems at various levels with different techniques, I would like to review quickly a series of data we have on one commodity. This started with the problems of cranberries and how they should be packaged. In this particular instance, there was one very nice set of data available before the study started. These data indicated that sales of boxes had run ahead of sales of bags over the preceding few years, and that increased sales of boxes and decreased sales of bags seemed to be the long run trend. This was set of data No. 1. The second set of data came from an experiment in a few stores in which customers were given a choice of bags or boxes. There were equal displays of both kinds of packages and each day the displays were rotated so that customers had an even chance of seeing one or the other kind of package as they approached the counter. When the sales were tallied at the end of the experimental period, the data seemed reversed. In this instance, the bags outsold the boxes about 3 to 1.

Now, at this point we look as though we have data that are difficult to reconcile. But before we go into the meaning of these 2 sets of data, let me add the third set of information. As the customers picked up packages, they were interviewed. Almost everyone who made a selection during the experimental period was questioned. When those who bought boxes were asked why they bought them and those who chose bags were asked why they bought bags, very revealing and useful data were collected. However, when customers were asked if their preferred package had not been available, would they have taken the so-called nonpreferred, it was found that many would have swung over.

An analysis of all available data showed that if you put cranberries in boxes, they sold; if you gave people equal choice, they chose bags; but if you asked them if they really cared, the story was much less conclusive. In this particular commodity, people were quite likely to accept whatever was available and therefore the choice of container could be based on convenience to the packers and stores and not on consumer preference. We should also add to this potpourri the fact that before the study the produce managers themselves had a very firm idea of what the consumers wanted—they were sure people wanted boxes. Here is a full

picture of the kinds of seeming conflict there is in the field of marketing, wherein you need each subsequent level of data to explain and understand the previous levels and to predict for future market behavior.

As we go ahead in the study of consumer behavior and as we advance in our ability to predict consumer acceptance, there must be a growing tolerance on the part of those who are using data from various sources. If we are to refine our methods and our understanding, there must be an increasing awareness of the consumer as a person. He is not an objective statistical machine, a cold economic theory behaving according to historic trend, or a philosopher's concept of logic. Consumer behavior is always related to a concept of reasonableness—reasonableness to the individual and to no one else. The consumer behaves as an individual economic man within a given situation which changes constantly. In studying his behavior and interviewing him about his motives, we must remember that his actual behavior and his concept of his own behavior are not always identical. They're compounded of actuality and his own concept of self. We must combine studies of what people say and what they do, to try to understand why we find discrepancies between the two when discrepancies do exist.

As we study consumers and their reasons for behavior, we discover that they are knowledgeable buyers within their own framework of needs and values. Their reasons for preferences reveal many criteria, strict ones, intelligent ones, and you can confuse and tempt them, but only up to a point.

For the future, we need to know more about principles involved in the psychological and sociological variables that influence behavior. All of this has to be analyzed by product class, possibly by price within product class. Some day we may be able to take a product and proceed to score it on general attributes or values. Perhaps we may be able to use the six that M. E. John has been developing at Pennsylvania State University. They are the functional values, status-giving values, self-esteem, sentimental value, aesthetic value, and, of course, the classic, economic value. Possibly, after scoring commodities on an established scale, we could go on to predict acceptability without actual market experiments. But as long as the psychological set of human beings continues to be a dynamic mechanism, constantly formed and reformed as a result of living in a changing world, we will never be able to mechanize our predictions so that analysts can sit back in their chairs and make easy, secure predictions. We can, at present, only understand the human being as a product of his past and of his present. We cannot expect to predict without error into a world which may contain a technology we haven't yet imagined. Prediction of behavior will always be a combined product based on an

understanding of human beings from past study coupled with premarketing research of new or changed products to gain insight into the satisfaction to be derived from the new product. We will keep measuring, predicting, testing our predictions, and revising our hypotheses and our methods.

When we become more knowledgeable in the understanding of behavior, we shall be able to develop a reasonably efficient marketing structure. Research in this field will never take the place of originality, intelligent hunches, and experience. But it will certainly help avoid pitfalls and, in a positive sense, will give a framework within which the ingenious and the creative can work.

More than this I do not yearn for. I would not joyfully anticipate a time when those in a position of power, either in government or business, could so predict our behavior and be so prepared to channel it to their own interests that we would lose our present way of life. I feel this way even though I fully recognize how uneconomic or illogical some ways of life appear to those who observe from a purely professional point of view.

DISCUSSION: THE PLACE OF CONSUMER EDUCATION IN INCREASING THE DEMAND FOR FOOD

KARL SHOEMAKER
University of Wisconsin

The paper of Robert Kramer is a very good technical analysis of the effect of consumer education on the demand for food and the important part extension can play in that program.

I agree with Kramer basically on the relatively small opportunity to expand the total demand for food. I am not quite as optimistic about no one suffering from hunger pains but certainly it is not a problem of great consequence.

A problem of significant consequence, however, is underconsumption of calcium, protein and some vitamins. As quoted in *Food Field Reporter* (July 11, 1955), only one Kansas child in 10 has a diet conforming fully to recommended nutrition standards, according to a survey by Kansas State College. Three out of every 10 children get adequate amounts of milk, but the average child's diet does not supply adequate calcium. Kansas is not unique in this respect.

Extension consumer education programs can make a major contribution in correcting this situation by getting the right foods consumed rather than just "enough" food consumed. Such an adjustment in food consumption would create a need for an adjustment in food production. This undoubtedly would adversely affect certain producers as Kramer points out.

I believe that producers should recognize the needs of the market and will profit by adjusting accordingly. Producers should be increasingly aware of consumer education programs. They should be alert to desirable changes in production patterns based on consumer likes and dislikes.

Kramer's paper suggests the problem of allegiance on the part of the consumer education specialist. Most of us in extension endeavor to develop programs that will benefit the producer. Historically this might be considered tradition. The consumer education specialist has a definite responsibility to service the consumer in good faith. If a program in a certain area were designed to benefit the producer to the disadvantage of the consumer, I am sure that program would be doomed to failure. This does not mean that consumer education programs cannot be designed to be mutually beneficial to consumers and to producers generally.

I believe that consumer education can do much to increase the demand for *good* food (a) nutrition-wise, (b) quality-wise, and (c) price-wise. Our dairy caravan this winter brought out the great interest in grade labeling and quality comparisons by consumers. The panels on consumer grades were always well attended (105,000 attended the show) and questions were more numerous than on most other panels of the show. Consumers, school teachers and others know little about quality. The need is great.

According to Harvey Weavers of our State Dairy Division, 35% of the butter picked up in retail stores for sampling in 1951 graded 89 score or less. In the first half of 1955, only 2.9% of the butter sampled graded 89 score or less.

Wisconsin passed a compulsory butter grade-labeling law that went into effect July 1, 1954. Consumers are still learning that the butter grade is on the carton and, more important, just what that grade means in terms of quality. The figures show we are selling a lot less poor quality butter. This is hard on the producer of poor quality but . . . .

The consumer specialist is in a unique position to play a key roll in influencing trade practices and marketing programs. The close contact with the wholesaler and retailer makes it easy to plant ideas and discuss new innovations. Contact with the consumer should make it easier to introduce new products and new methods and test acceptability. Relations with production specialists should facilitate channeling information to the producer.

Kramer stresses the strong influence of income on the demand for food. He also states that a sound consumer education program must be tied to reliable information on nutrition. Any consumer education program must have a balance between the nutrition aspects and economic aspects if that program is to be successful.

DISCUSSION: THE PLACE OF MERCHANDISING AND PROMOTION IN EXPANDING THE DEMAND FOR FOOD

ROBERT M. WALSH
Agricultural Marketing Service, USDA

In his paper Professor Kohls restricts his attention mainly to two concepts, (1) point-of-sales activities and (2) advertising, although he recognizes that other important activities are involved in accomplishing the selling job. Basically, I believe the differences I have with his conclusions arise from what I consider to be an unnecessary restriction of the scope of merchandising activities and an undue emphasis on the role of advertising alone. In doing a selling job adver-

tising is only one of the factors involved. Merchandising and promotion include many field-staff activities in promoting sales events and use of display materials and display space, and in providing numerous dealer service aids. Merchandising and promotion also include all of the items Professor Kohls mentions at the beginning of his paper but then largely neglects, including decisions as to product form, decisions as to appropriate marketing channels and agencies, efforts to control the product as it moves from producer to consumer, decisions as to brand differentiation policy, and decisions as to pricing policies. If we include all of these things, it can be shown that merchandising *and* promotion, about which serious doubts have been expressed, can do things in expanding the demand for food.

First, it is possible through merchandising and promotional activities to expand the demand for fairly broad classes of food commodities. A few examples may be used to illustrate this point.

Domestic consumption of oranges in fresh and processed forms increased more than one-fourth in the past six years. According to the national consumer panel purchase data reported under contract to the U. S. Department of Agriculture by the Marketing Research Corporation of America, retail prices declined this period by about 5 percent for fresh oranges, 15 per cent for canned orange juice, and by about 40 percent for frozen concentrated orange juice. The price declines, if weighted by the quantities purchased in 1949-50, averaged about 15 percent, and were not sufficient in themselves to induce the full increase in consumer purchases that took place. Nor were changes in consumer income sufficiently great to account for the difference. Here is an example of shifts in consumer demand, reflected in increased consumption, brought about primarily by improved merchandising methods and successful promotion.

How was this accomplished? When confronted with rapidly increasing production, orange growers, processors, and shippers were fortunate in the successful development of a new way of merchandising oranges—as frozen, concentrated juice. Adoption of this new product form was a "creative response" to innovation, and was a major merchandising decision. This new product, as well as oranges in fresh form, has been and is being vigorously advertised and promoted.

Consumer purchases of frozen concentrated orange juice more than doubled from 1949-50 to 1954-55, representing in the last year more than half of the total household purchases of oranges and orange products. Purchases of fresh oranges held about steady during most of the period but declined slightly in the last year. Purchases of canned single-strength orange juice, on the other hand, declined about 25 percent over the six-year span. The increase in purchases of frozen concentrated juice was much more than sufficient to offset the declines in the other items. The net result has been successive shifts to the right in the composite demand curve for orange products as a whole. These shifts have occurred mainly as additional families have entered the market for the new product.

A second case to be cited involves a problem yet to be solved, but one that preliminary work indicates is capable of solution through aggressive merchandising and promotion. Under the National Wool Act of 1954 provision is made for a "set-aside" of funds from payments due to wool growers, subject to their approval, for the purpose of financing merchandising and promotional programs for sheep and lambs and the products thereof. The promotional program would

be carried out by an approved agency representing sheep producers. Such an agency has been established. Initial emphasis, if the "set-aside" is approved, would be placed on lamb and mutton, since cash receipts to farmers from sales of sheep and lambs and from farm-produced mutton and lamb, represent two-thirds to three-fourths of total cash receipts from sheep production, including receipts from sales of wool.

Production of lamb and mutton does not change much from year to year. Hence, in the short run the supply is relatively stable. Most of the increase in demand would have to be reflected in higher prices.

Can increased merchandising and promotional efforts induce consumers to pay somewhat higher prices for lamb, with no material change in the quantity consumed? On the basis of somewhat limited knowledge of existing distribution and merchandising practices, I believe the answer is yes. First, the bulk of the lamb consumed in the United States is mainly in two areas, (1) from about Washington, D.C., northeastward along the Atlantic seaboard and (2) in Pacific Coast cities. Increased promotional efforts in other areas would serve to broaden the demand, geographically, and hence result in somewhat more stable, and higher, prices. Second, some cuts of lamb, such as the breast and shank, are sold at unusually low prices, around 10 and 15 cents a pound, whereas the preferred cuts, the leg and the loin particularly, are sold at relatively high prices. Promotional activity conducted in Salt Lake City within the past year has demonstrated that demand for the less preferred cuts can be increased materially, with resultant higher prices for such cuts. Another unanticipated result accompanied this change. Retailers reduced prices for the most preferred cuts. Nevertheless over-all returns on lamb and mutton carcasses were increased, and sheep and lamb producers benefited accordingly. Given a situation of this sort, we have a painless way of inducing consumers to pay higher prices on the average. The economy minded still find good buys in the usually neglected cuts and the luxury minded benefit from lower prices for the so-called preferred cuts.

Numerous other examples might be cited. The wine industry has built up a demand in 20 years that did not exist in 1933. The Cling Peach Advisory Board is probably one of the most successful advertisers and promoters in the agricultural field. They cannot do the whole job with advertising alone. They have a dealer service staff and tie-in with related industry advertising. Similarly, the American Dairy Association is doing an effective job in promoting sales of dairy products through advertising, special events such as June dairy month, ice cream festival, cheese festival, merchandising aids including point-of-sale materials, and public relations activities. Some indication of success in these endeavors is given by the fact that in the dairy marketing year ended March 31, 1955, household consumer purchases of butter were 13 percent larger than in the previous marketing year, an increase that can be explained only in part by a 10-percent drop in price. Moreover, in June 1955 household consumer purchases of butter showed a further gain of 12 percent over June 1954, while prices actually were a little higher. That this was not a substitution effect is borne out by the fact that margarine consumption also was up in these two periods.

There is little doubt that merchandising and promotion, defined broadly, can be effective in increasing the demand for specific foods or food groups.

On another point, Professor Kohls has expressed reservations as to the effect

of such activities on the total demand for food. Kohls cites an impressive list of agricultural producer groups and processor-distributors who are spending large sums of money on merchandising and promotion of food products. Possibly there is no way of proving or disproving the effect of such expenditures on the total demand for food. But a little light appears when we look at the well known statistic that total consumer expenditures for all foods in the past 10 years have remained relatively static at 25 or 26 percent of the national disposable personal income, per capita, as calculated from U. S. Department of Commerce data. Actually the percentage of income spent for food is a little higher than it was in 1935-39, when it averaged 23 percent of disposable income.

Why is this significant? In accordance with Engel's law, the percentage of total income devoted to necessities should decrease as income rises and national income per capital has been rising. New consumer goods and services, including improved housing, improved car models, new home appliances, new modes of travel and facilities for recreation, should be taking a larger proportion of net consumer income. But they are not. Perhaps one reason for this is that intensive efforts devoted to improved merchandising and promotion of food products have taken such products out of the class of sheer necessities into that of the semiluxury group. Consumers today are buying more food services and more of the foods they like, which incidentally contain more nutrients (other than calories) than they did 15 years ago. This is indicated by the USDA index of food consumption, which shows a 13- percent rise in consumption per person from 1935-39 to 1954, reflecting an increase in consumption of the more expensive types of food in place of some of the less costly foods. Innovations in merchandising undoubtedly have contributed in an important way to this trend. And promotion, including educational activities relating to diet and health, perhaps has been equally as significant.

I believe I have demonstrated that merchandising and promotion, taken as a whole and considering all aspects, can be effective in increasing the demand for some foods. Also, this field of activity appears to have some importance in sustaining or even increasing the total demand for food, including the demand for additional food services.

As a final comment, I should like to point out that when merchandising innovations are made they are frequently accompanied by price changes, and by advertising. The introduction of gallon jugs for sales of fluid milk in a number of markets in recent months, for example, has been widely advertised and emphasis has been placed on the price-reduction feature. How to disentangle the effect of each element in comparatively short-run situations is a mystery. Advertising is but one of the tools used to increase sales. Advertising does not go by itself. Efforts to study the effect of advertising on sales apart from other promotional and merchandising activities that go with it are likely to be misleading or inconclusive.

THE LOW-INCOME FARM PROBLEM

(Joint Session with Rural Sociological Society)

Chairman: M. E. John, Pennsylvania State University

TRENDS AND CHARACTERISTICS OF FARM POPULATION IN LOW-INCOME FARMING AREAS

Louis J. Ducoff
Agricultural Marketing Service

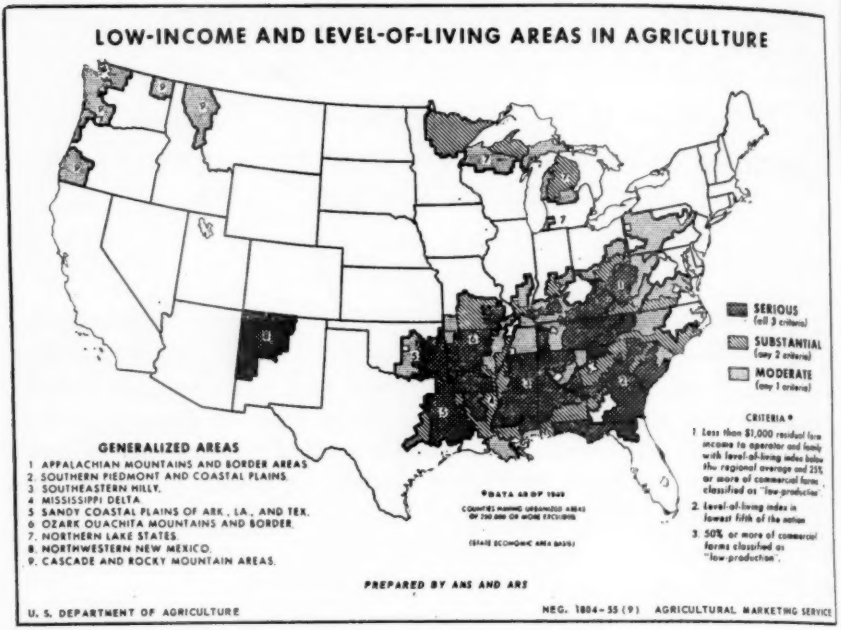
MY ASSIGNMENT on this program is to discuss the population trends and composition of the low-income farm-operator families and to point up some of the demographic and other relevant characteristics of this population group. In describing the composition and characteristics of the low-income farm population it will be helpful to make certain comparisons with the higher income population group in agriculture. To a large extent what I have to say is introductory and descriptive. My colleagues on the program have the clinical job of analysis and problem diagnosis.

Low-Income Farming Areas

What is the universe with which we are dealing? We could start with a definition and delineation of low-income farm areas in the United States. Or we could start with a definition of "low-income farm family" and talk about the population trends and characteristics of all farm families in the United States falling within our definition. Since there may not be (and perhaps should not be) any single set of criteria for area delineation or family identification and since we do not wish this paper to take up more than its pro rata share of your time, we shall approach the problem from the standpoint of the areas that have been delineated in the report prepared for the Secretary of Agriculture, *Development of Agriculture's Human Resources: A Report on Problems of Low-Income Farmers.*[1] The map shows the concentration of low income and the grouping into nine generalized areas within which the low-income problems are somewhat similar.

The area approach has the advantage that more information is available on the farm population tabulated by areas than on farm population tabulated by income levels. The disadvantage is that not all farm families living in the areas delineated as low income and low level of living are actually low-income families. Nevertheless, the proportion of low-income farm families is so high that some conclusions can be drawn regarding

[1] U. S. Government Printing Office, Washington 25, D.C., April 1955.


LOW-INCOME AND LEVEL-OF-LIVING AREAS IN AGRICULTURE
SERIOUS (all 3 criteria)
SUBSTANTIAL (any 2 criteria)
MODERATE (any 1 criteria)
GENERALIZED AREAS
1. APPALACHIAN MOUNTAINS AND BORDER AREAS.
2. SOUTHERN PIEDMONT AND COASTAL PLAINS.
3. SOUTHEASTERN HILLY.
4. MISSISSIPPI DELTA.
5. SANDY COASTAL PLAINS OF ARK., LA., AND TEX.
6. OZARK OUACHITA MOUNTAINS AND BORDER.
7. NORTHERN LAKE STATES.
8. NORTHWESTERN NEW MEXICO.
9. CASCADE AND ROCKY MOUNTAIN AREAS.
CRITERIA *
1. Less than $1,000 residual farm income to operator and family with level-of-living index below the regional average and 25% or more of commercial farms classified as "low-production".
2. Level-of-living index in lowest fifth of the nation.
3. 50% or more of commercial farms classified as "low-production".
* DATA AS OF 1949
COUNTIES HAVING URBANIZED AREAS OF 250,000 OR MORE EXCLUDED.
(STATE ECONOMIC AREA BASIS)
PREPARED BY ANS AND ARS
U. S. DEPARTMENT OF AGRICULTURE
NEG. 1804-55 (9) AGRICULTURAL MARKETING SERVICE

the more distinctive characteristics of the low-income farm population. Contrasts among subareas differing in degree of concentration of the low income farm population help to identify further characteristics of the low-income farm families. Supplementary information derived from tabulations of farm families by income levels will also be introduced.

The low-income areas in the United States, concentrated largely in the South and Southeast, had in 1950 nearly half of the entire rural-farm population—11 million out of a total of 23 million. More than fourth-fifths of the farms in these areas had gross sales of less than $2,500 in 1949 and half of these were operated by full-time farmers under 65 years of age.[2]

Population Trends in Low-Income Farming Areas

The sharp decline in the farm population of the United States that occurred during the 1940-50 decade proceeded at a somewhat faster rate from the low-income farming areas than from the rest of the farm population. The net decline in rural-farm population showed a steady progression from 21 percent in the medium and high-income areas of the United States to 28 percent in the areas of most serious low income (table 1).

The more rapid decline in farm population of low-income areas was due entirely to higher migration rates, since the farm population in the

[2] *Ibid*, p. 9.

TABLE 1. RURAL-FARM POPULATION, BY SEX, FOR FARMING INCOME AREAS, UNITED STATES, 1940 AND 1950

Level of income area	1950			1940			Percentage change 1940–1950		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
	000	*000*	*000*	*000*	*000*	*000*	*Pct*	*Pct*	*Pct*
United States	23,048	12,079	10,970	30,216	15,940	14,276	−23.7	−24.2	−23.2
Medium and high	12,060	6,407	5,653	15,349	8,238	7,111	−21.4	−22.2	−20.5
Low	10,988	5,671	5,317	14,867	7,702	7,165	−26.1	−26.4	−25.8
Serious	5,087	2,612	2,475	7,066	3,629	3,437	−28.0	−28.0	−28.0
Substantial	2,746	1,413	1,333	3,737	1,935	1,802	−26.5	−27.0	−26.0
Moderate	3,155	1,646	1,509	4,065	2,139	1,926	−22.4	−23.0	−21.7

NOTE: Figures are rounded to the nearest thousand without being adjusted to group totals.

low-income areas have slightly higher fertility ratios than in the medium and high-income areas. The migration rate for the low-income areas was nearly 4 percent of the population in these areas at the beginning of the decade, after allowing for normal mortality experience (table 2). The migration rate during the same decade for the farm population outside the low-income areas was 28 percent or nearly 1/6 lower. Within the low-income farming areas the migration rate varied from 28 percent for the areas of moderate concentration of low-income farms to 37 percent for

TABLE 2. RATES OF NET MIGRATION OF THE RURAL-FARM POPULATION 1930–40 AND 1940–50, AND REPLACEMENT RATIOS OF RURAL-FARM MALES OF WORKING AGE, 1950–60, FOR FARMING INCOME AREAS

Level of income area	Rate of net migration[1]		Replacement ratios, 1950–60[2]	
	1930–40	1940–50	Working age group, 20–64	Working age group, 25–69
United States	−12.7	−30.9	168	135
Medium and high income farming areas	−13.2	−28.0	143	124
Low-income farming areas[3]	−12.5	−33.8	200	148
Serious	−14.2	−36.9	221	159
Substantial	−13.9	−34.9	206	151
Moderate	− 8.3	−27.8	169	132

[1] Change due to net migration expressed as a percentage of farm population alive at both beginning and end of decade.

[2] Ratio of the expected number of *entrants* into selected working ages during a decade to the expected number of *departures* from these working ages during the decade through death or reaching retirement age. This ratio is an index of the potential replacement if no net migration from or to an area occurs.

[3] Areas delineated in "Development of Agriculture's Human Resources—A Report on Problems of Low-Income Farmers."

the areas of serious concentration. During the 1930-40 decade, when generally depressed economic conditions neither stimulated nor afforded much opportunity for migration, there was little difference in the rate of migration of the farm population out of the low-income areas and the rate of migration in the rest of the United States.

Coupled with the higher migration rates of the population from low-income areas has been a somewhat higher population growth potential. Historically, the higher fertility rates in the low-income farm population have exerted a continuing population pressure resulting in a serious imbalance between population and resources. Although heavy rates of migration since 1940 have mitigated this imbalance, it is being counteracted in part by a more rapid population growth rate in the low-income areas than in the rest of the farm population. During the present decade the number of rural-farm males reaching working age in the low-income

farming areas is double the number of males who leave the labor force through death or retirement. Between 1950 and 1960, an estimated 1,280,000 farm youths in low-income farming areas will reach working age while only 640,000 older farm men will die or retire. The comparable replacement ratio in the rest of the farm population of the United States is 143 males reaching working age for every 100 who leave the labor force through death or retirement.[3] For the moderate, substantial and serious areas of concentration of low-income farm families, replacement ratios are respectively 169, 206, and 221. Thus, even if we assumed that labor requirements in agriculture during the 1950-60 decade were to remain unchanged (an obviously unrealistic assumption in view of the continuing decline in labor requirements and continuing gains in agricultural production per worker) these replacement ratios for the low-income areas mean that in the absence of outmigration or shifts to nonfarm jobs there would be twice as many men reaching working age as the number of jobs vacated.

These replacement ratios point up the importance of programs for education and training of children and youth in these areas. They indicate that to prevent an accumulation of underemployment or unemployment there must be an increase of employment opportunities within the areas through bringing in industries or heavy outmigration of youth, or both. Also, if we look beyond the present decade to 1960-70, when the babies born during the 1940's will be passing their 20th birthdays, we can expect these ratios to be higher. For the farm population of the U.S. it is anticipated that the replacement ratio for the 20-64 year age group which was 179 in the 1940-50 decade and 168 in the 1950-60 decade may be 185 in the 1960-70 decade.

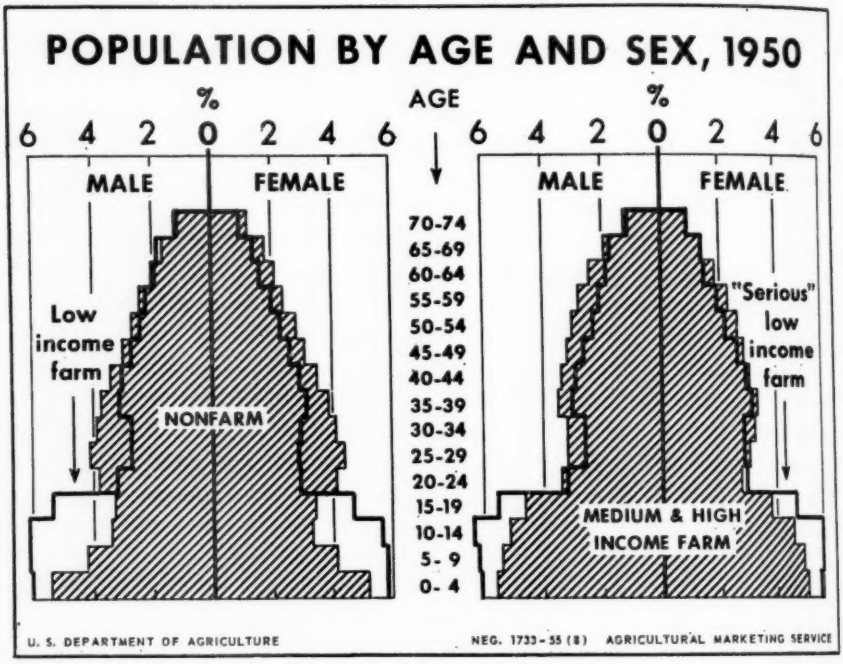
Composition of Farm Population in Low-Income Farming Areas

Comparison of the age and sex composition of the farm population of low-income areas with that in the middle and high-income areas is facilitated by use of population pyramids. Pyramids for the farm population in areas classified by level of income and for the nonfarm population are shown in the chart below. The contrast is striking when the "serious" low-income areas are compared with the middle and high-income areas. Serious low-income areas have higher proportions in each 5-year age group under age 20 for both males and females. From ages 20 to 65 or 70, the serious low-income areas have deficiencies in each 5-year age group, especially marked in the case of males.

[3] The replacement ratio is the number of farm youths reaching age 20 for every 100 older men who die or retire during the decade. Data are from a report to be issued shortly by the Agricultural Marketing Service.

The contrasts are even greater if we compare the age-sex composition of the farm population in low-income areas with that of the nonfarm population of the United States. In low-income areas, children and youths under 20 make up 46 percent of the population compared with 32 percent in the nonfarm population. On the other hand, persons 20 to 59 years of age are only 44 percent of the farm population in low-income areas compared with 55 percent of the nonfarm population.

The farm population in the low-income areas has about the same proportion of the aged as in the rest of the farm population. However, the



proportion of children and youths under 20 is much higher and the proportion in the productive adult ages is lower. This makes it quite clear that the economic burden falling on the adults in the productive age groups is greater in the low-income areas than in the medium or high-income farming areas. In 1950, the dependency ratio, defined as the number of persons under 15 and persons 70 years and over per 100 persons 20 to 64, was 85 for the low-income areas and 67 for the rest of the farm population (table 3). Within the low-income areas it varied from 76 in the moderate to 89 in the area of serious concentration of low-income farm families.

The ratios of children to women of child-bearing age reflect the rela-

tive birth rates in recent years for different population groups. In earlier years there were marked differences in fertility ratios for population groups classified by income. The baby boom of the last 15 years narrowed these differentials somewhat, but they still exist to some extent, especially when the "serious" or "substantial" low-income areas are compared with the medium or high areas.

The proportion of the farm population that is nonwhite is four times as large in the low-income areas as in the remainder of the United States farm population, 24.2 percent compared with 5.6 percent. In the Mississippi Delta areas the proportion nonwhite in the farm population was 50 percent. On the other hand, in some of the subareas the nonwhite popula-

TABLE 3. FERTILITY AND DEPENDENCY RATIOS FOR THE RURAL-FARM POPULATION, FOR FARMING INCOME AREAS, 1950

Level of income area	Fertility ratio[1]			Dependency ratio[2]		
	Total	White	Non-white	Total	White	Non-white
United States	521	492	695	75	70	110
Medium and high	503	493	673	67	66	97
Low	541	491	701	85	77	113
Serious	552	504	696	89	81	117
Substantial	570	494	719	87	77	112
Moderate	499	472	678	76	72	105

[1] Ratio of children under 5 to 1,000 women aged 15–49 years.
[2] Ratio of children under 15 and persons 70 years of age and over to 100 adults aged 20 to 65 years.

tion is very small, less than one percent in the Northern Lake Area and less than 3 percent in the Appalachian Mountain Area and in the Cascade and Rocky Mountain Areas.[4]

Educational attainment is considerably lower for the farm population in the low income areas. Among adults in 1950, 55 percent had completed less than 8 years of schooling, while in the rest of the farm population of the United States only half as large a proportion completed less than 8 years. Within the subareas of the low-income area the proportion with so little education varied from 20 percent in the Cascade and Rocky Mountain area to 73 percent in the Mississippi Delta area.[5]

Levels of Living of Low-Income Farm Operator Families

The farm-operator family level of living index available for all counties and economic areas of the United States was one of the criteria for the delineation of the low-income areas. It is not surprising, therefore,

[4] *Development of Agriculture's Human Resources*, p. 44.
[5] *Ibid*, pp. 9 and 44.

that these areas show much lower than average indexes of level of living. The combined low-income areas have an average index for 1950 of 84, compared with 122 for the U.S. as a whole, and the serious areas have an average index of 66 (average county in U.S. for 1945 equals 100).

The total annual income available to a family is the most important determinant of the family's level of living. Data from a matching study of the 1950 censuses show that there were 1,366,000 farm-operator families whose total net cash income from all sources, farm and nonfarm, was less than $1,000 for 1949.[6] Their average cash income was $464 per family. Seventy-one percent of these families were in the South. An additional 1,206,000 farm-operator families were in the $1,000 to $2,000 income group and their average income for 1949 was $1,392. Fifty-four percent of these families were in the South. Families in these income groups averaged four persons. Thirty-five percent of the commercial farm families with less than $1,000 income operated cotton farms and another 22 percent operated other field-crop farms. In the $1,000 to $2,000 income group 17 percent operated cotton farms, 24 percent other field-crop farm, and 42 percent operated livestock farms. The proportion operating livestock farms in the under $1,000 income group was 30 percent.

Some additional indications besides income of the level of living of these families are provided by certain information relating to housing and housing facilities of farm-operator families. Nearly 4/5 of the farm families in the under $1,000 income group had no piped running water inside their dwelling, as compared with 57 percent for all farms in the United States. Only 13 percent had flush toilets inside the dwelling as compared with 30 percent for all farms; 85 percent had no installed bath tub or shower compared with 67 percent for all farms. Only 62 percent had electricity compared with 78 percent for all farms. About 39 percent had no mechanical or ice refrigeration compared with 22 percent for all farms. Only 34 percent had a kitchen sink compared with 58 percent for all farms. The fact that the comparison here is made with all farms rather than with farms at the medium or higher income levels minimizes the contrast.

Some Characteristics of the Farms Operated by Low-Income Families

Of the two million farms in low-income areas in the United States with less than $2,500 crop sales, 1,400,000 were commercial farms and the re-

[6] Most of the data cited in this section are from *Farms and Farm People*, U. S. Department of Agriculture and U. S. Department of Commerce, June 1953. For a comprehensive analysis of the characteristics of low-income farms, see statement by W. H. Nicholls, *Low-Income Farm Families and Economic Progress*, in Hearings before the Joint Committee on the Economic Report, 84th Congress, 1st Session, Washington, 1955, pp. 664-697.

maining 600,000 were the part-time, residential, and abnormal farms. The commercial farms in the low-income areas averaged considerably smaller in acreage than in the rest of the United States—138 acres as compared with 359 acres of all land in the farm; and crop-land harvested, 41 acres compared with 118 acres for the rest of the United States. Sharecroppers constituted 16 percent of all the commercial farms in the low-income areas as compared with less than 3 percent of the commercial farms in the rest of the United States. All types of tenants including sharecroppers were nearly 37 percent of the commercial farms in the low-income areas as compared with 27 percent in the rest of the United States.

Resumé of Human Resources in Low-Income Farming Areas

This paper has concentrated on presenting a brief picture of the human resources in the farm population of low-income farming areas. How can we best summarize the main facts? The first is that despite the geographic concentration of the low-income farming areas in the South, they account for nearly one-half of the farm population of the United States and low-income families predominate in these areas. These areas contribute heavily to the manpower needs of our expanding economy. Between 1940 and 1954, an estimated one-half of the expansion in the nonagricultural labor force was supplied by migration from the farm population and over half of this was from the low-income farming areas.

The most distinctive characteristic of the farm population in these areas is the high proportion of children and youths and the low proportion of adults in the productive ages. Nearly half (46 percent) of the farm population in the low-income areas is under 20 years of age. This emphasizes the importance of focusing programs on greater investment in the children and youth of these areas. Better and more extensive educational programs, including vocational training and guidance facilities, should have the first priority in action programs. Vocational training programs should be realistically geared to opportunities for productive employment.

The proportion of the older age groups in low-income areas is not very different from that in the rest of the population or in the nonfarm population. But in the low-income areas, individual and community resources are less adequate to provide for the income needs of many of the older persons. The recent extension of Old-Age and Survivors Insurance to farm operators, along with the rather liberal provisions for speedy qualification of those near retirement age, constitutes a very important step forward in meeting these needs for many families in the very near future. The further action program needed is largely one of information and extension services to assist those farmers at or near the borderline of qualification to adjust their enterprises so that they can gain social security coverage.

ECONOMICS OF THE LOW-INCOME FARM PROBLEM

KENNETH L. BACHMAN*
Production Economics Research Branch, ARS

THE low-income problem is a relative rather than an absolute concept. This idea is of basic importance. The real questions that arise in appraising the problem are two. (1) Are individuals with low incomes disproportionately numerous in agriculture? (2) What is happening to the low-income problem through time?

The first question involves comparisons with other sectors of our economy. Only about a seventh of the families reporting income in 1949 were farm families. Nicholls estimates that farm families accounted for one in three or four low-income families in the United States in 1949.[1] From the standpoint of families *in the labor force,* which represents the central focus of this paper, the share of low income families in agriculture was even larger.

The second question involves comparisons through time. The test comes down to whether or not there has been a significant closing of the gap between the farmers with low incomes relative to the general level of income in agriculture and other sectors.

If we define agriculture to include part-time and residential units as well as commercial farms, progress has been slow in relative terms. From 1930 to 1950, the percentage of all farms classified as low income dropped from about 35 to 30 percent. In making these estimates, adjustments were made for over-all changes in prices of agricultural products and in product per worker.

If we think primarily of commercial farmers—those who depend primarily on farming for a livelihood—the picture is darker. The percentage of commercial farms classified as low income on this basis was slightly higher in 1950 than in 1930.[2]

The theory of resource use presumes that when one sector of the

---

* The author is indebted to Robert B. Glasgow, Glen T. Barton and other fellow workers in the Production Economics Research Branch for helpful suggestions in preparing this paper.

[1] "Low Income Farm Families and Economic Progress," manuscript by William H. Nicholls, Washington, D.C., 1954.

[2] *Low Production Farms,* by J. V. McElveen and K. L. Bachman, Agriculture Information Bulletin No. 108, June 1953.

Using a somewhat different approach, a recent study in the Tennessee Valley areas indicates that income per farm worker in low-income counties has improved no faster than have incomes in the higher income counties. See "Differences in Farm Income and Employment in the Tennessee Valley Region Counties," Report No. 2 of the Project on Research in Agriculture and Industrial Development in the Tennessee Valley Region, July 1953, by Vernon W. Ruttan, p. 11.

economy is in a disadvantaged position, certain adjustments set in that will more or less automatically bring the marginal products from resource use back into balance with other sectors, industries, or areas. Apparently this has not happened in the case of the low-income sector in agriculture during the past 25 years, that include 15 years of a full employment economy.

The Developing Economy and the Low Income Problem

To evaluate the causes of and the possible solutions to the low income problem, it is necessary to examine the nature of the present and the prospective growth in the economy generally and in the agricultural sector. The extent of the problem in the future will depend largely on the kind of developments in agriculture and in the economy. Productivity levels on most low-income farms have increased and they will continue to do so. Whether or not these farms continue as low-income farms will depend on the relative rate of growth in the low-income sector in particular and in agriculture generally. As Erven Long has said, the problem of low income can be considered as "essentially a detail in the problem of economic growth or development."[3]

Looking backward, agricultural output per worker at the end of World War I was only a little more than a third of the present level. Real incomes per worker, in both industry and agriculture, are double those in 1920. Numbers of farms have declined, especially in recent years. From 1940 to 1950 the number of all farms dropped by more than 10 percent and the number of commercial farms by more than 20 percent.

Projections of requirements in 1975 in the setting of a relatively prosperous economy indicate a general continuation of these trends. In a recent study, real incomes per person were projected to be about two-thirds higher than the 1951-53 level.[4] National output would be doubled.

In terms of production, agriculture would continue to expand. The estimated requirements for farm production would mean a farm output about a third greater than in 1951-53. The largest increases in needs would be in livestock and feed crops—that is, feed grains, hay, pasture, and protein feed.

Dr. Ducoff has pointed out another deep-seated characteristic of American agriculture: The continued large net movement from agriculture to nonfarm occupations. Farm birthrates are high. With the increased use

[3] "Assisting Low Income Farmers," by Erven Long. Paper presented before USDA Graduate School, November 1954.

[4] "Long Range Prospects for Agriculture," by Rex F. Daly, AMS, and Glen T. Barton, ARS, paper presented before the National Agricultural Credit Commission, Chicago, Illinois, June 6, 1955.

of labor-saving technology agricultural employment is decreasing rapidly.

These, as well as many of the other aspects, are obviously very closely tied to continuous prosperity. But in a depression situation the resource efficiency aspects of the low income problem would be completely different. Of some special importance, even in a prosperous situation, may be the rapidity of industrial labor-saving developments. Automation, for example, could affect greatly the kinds of employment opportunities in industry and perhaps at times the extent of these opportunities. Demands for unskilled and clerical labor, for example, may be reduced considerably if such developments are rapid.

In summary, two major forces underlie the current changes in agriculture: (1) The rapid development of labor-saving and yield-increasing technology adapted for use in agriculture has greatly increased productivity potentials. (2) Increasing industrial employment and wages provide attractive opportunities for large numbers of people who are not needed in commercial farming to move into industrial or service occupations.

The operation of these forces, however, has been uneven among commodities and areas. In the East North Central States, for example, output per hour in feed grains is 6 times as high and in food grains almost 5 times as high as at the end of World War I. In the South Atlantic States, output per hour for cotton and tobacco is less than double and only a little over 1½ times, respectively, the level at the end of World War I.[5]

Against this background of uneven developments the low-income problem in agriculture has continued to persist. The reasons are tied into the impact of these two major forces.

Gains from the use of new techniques have been much smaller in some areas and commodities than in others. Use of machinery, for example, is frequently better adapted to level areas and crops such as wheat than to hilly areas and crops such as tobacco.

For the United States as a whole, more than 40 percent of the income on small-scale commercial farms now comes from cotton and tobacco. Under the conditions that prevail where these farms are found, mechanization has been slow. In many instances full use of technological developments will involve both changes in size of farm and introduction of new enterprises.

Low incomes and capital levels have been important in slowing down agricultural development in many of these areas. Agriculture is a high user of capital. Innovations that involve new technological methods fre-

---

[5] Statistical supplement to "Changes in Farm Production and Efficiency," 1955 Annual Summary, USDA, PERB.

quently have been especially so. Even more important in a number of low-income situations, use of technological innovations involves discreet additions of capital that are large relative to present capital levels.[6]

On the other side of the picture, the extent and nature of farming adjustments in these areas depend a great deal on the extent of discounting of potential returns in alternative employment. Gains from labor-saving equipment, for example, depend on the values placed on labor. A recent study indicates that the value of a year's labor based on hired wage rates in the central Corn Belt is more than double the value in such regions as the southeastern hilly areas, the Mississippi Delta, or the Piedmont.[7]

Increases in local industrial activities in low-income areas have been uneven. As Ruttan has indicated, they provide increased incomes largely through part- or full-time, off-farm employment.[8] Many farmers continue to make their living on small inefficient units even in these local areas.

Finally, but of great importance, the rate of progress in low-income areas is frequently affected by the institutional, racial and cultural patterns that prevail in the areas. Difficulties involved in recombining resources, and consequently the rate of adjustment, are affected by whether ownership is in large or small units and by the suitability of established tenure arrangements to new farming systems. The inadequate education of low-income farmers in some areas may hinder their perception that they have a problem. It impedes their chances of getting information on new farming systems in agriculture or on off-farm employment opportunities. It often reduces the usefulnese of their labor resources outside agriculture. Differences in other imbedded cultural patterns may have similar effects.

Problem Situations

The prospective nature and influence of such factors on the economic aspects of the low-income farm problem can be focused more sharply by discussing some selected situations in which low-income farms are found. A glance at the map used in the recent report "Development of Agriculture's Human Resources" emphasizes the diversity of conditions that

---

[6] Availability of Capital and Production Innovations on Low-Income Farms," W. E. Hendrix, *Journal of Farm Economics*, February 1951, p. 69.

[7] *Productivity of Resources Used on Commercial Farms*, E. O. Heady, E. G. Strand, and J. A. Seagraves, U. S. Dept. of Agr. Tech. Bul. 1128. (In press.)

[8] "The Impact of Urban-Industrial Development on Agriculture in the Tennessee Valley and the Southeast," Vernon W. Ruttan, *Journal of Farm Economics*, Vol. 37, No. 1, February 1955.

are found in areas that range from highly rural to highly urban, from level to rough topography, and from dairy to cotton types of farming.[9]

1. In several low-income areas substantial industrial development exists and is likely to continue. The critical problem is one of more fully utilizing farm labor resources in the developing local economy.

Several areas in the Piedmont and Appalachian regions, for example, appear to be in this situation. In the Appalachian and Border region urban and nonfarm families accounted for more than three-fourths of the families in approximately half of the 45 economic areas used by the agricultural census. Industrial activity is increasing in many of these areas. A similar situation is found in the Piedmont-Coastal Plains region.[10]

Apparently, increased utilization of agricultural labor in the growing industrial activity can greatly benefit low-income farmers. Median net money incomes of people in local nonfarm employment in low-income areas are usually double or more the median incomes of farm people.[11] However, little study has been made by economists of nonfarm alternatives. Farm production economists have been rather inhibited in their study of alternatives in this respect. More information on earning prospects in farm and nonfarm employment is needed to speed desirable adjustments.

But the problem, even in these areas, is broader than this. Part of these people will want to remain in agriculture. Whether these farmers continue as a low-income problem or not will depend on changes made in the size and organization of their farms. As John D. Black pointed out in a recent article, the general tendency in such areas has been and continues to be one of large-scale abandonment of farms and too little change on the farms that remain.[12]

2. Less easy to determine are areas in which further industrial development is economically sound but will need to be encouraged if efficient use of local farm labor resources is likely. Much effort, for example, is being made to attract industry to rural areas in Mississippi and other states. Some current growth is apparent. It is of considerable consequence to know more definitely whether or not there exists a solid basis for further substantial increases in industrial activity in such areas and to know the types of industry that might be adapted to the areas. In this context,

---

[9] *Development of Agriculture's Human Resources—A Report on Problems of Low-Income Farmers*, USDA, Washington, D.C., April 1955, p. 7.

[10] Regions referred to here are thus delineated in *Development of Agriculture's Human Resources*, op. cit.

[11] Unpublished data derived from State Reports, U. S. Census of Population, Vol. II, Pt. 2, Ch. B.

[12] "Problems of the Low-Income Farmer," J. D. Black, *Journal of Farm Economics*, May 1955. See also Ruttan, *op. cit.*

prospective developments in industrial technology may be important. As atomic power develops, for example, will it increase the comparative advantage of industry in low-income areas that are now farther from sources of power?

Some informational guides from the standpoint of the economics of industrialization with respect to urban areas have been developed. Relatively few studies are available in the context of more rural areas.

3. In a number of rural low-income areas financial and ownership conditions are relatively favorable and there exists considerable opportunity for a general increase in agricultural productivity through adoption of modern technology and increases in size within present types of farming.

Parts of the Southeastern Coastal Plains and the Mississippi Delta areas may be cited as examples of areas that appear to be in this situation. In both of these areas, adjustments in size are made easier by the fact that a large percentage of the land is now in relatively large ownership units. Frequently, however, low-income farmers are croppers, share-tenants, or small owners.

For able owner-operators now on low-income farms in these areas, opportunities for increased productivity are perhaps more favorable than in other areas. A greater general understanding of the working of commercial agriculture, the simplicity of adjustments, and the fact that some of these farmers may now have a part of their land operated by a cropper all help to facilitate adjustments.

Opportunities for sharecroppers and tenants are more limited. Some of them may find alternative opportunities for increasing productivity in the new systems of farming. The larger share, however, apparently are engaging in nonfarm work. The discounting of potential returns in nonfarm employment apparently is considerably less in these situations than in those where land ownership is involved. Mechanization in these areas has frequently followed rather than preceded occupational adjustments on the part of croppers and tenants in recent years.

Most agricultural economists would think it likely that low-income farmers who remain in such areas will increase productivity by a fourth or perhaps a half in the next two decades. Such changes are good, and in some instances they may be all that is possible. But changes of this kind will not solve the low-income problem if real incomes generally increase by two-thirds.

4. Problems of rapid adjustments are most acute in rural areas where agricultural potentials, even though considerable, involve new systems of farming.

In many low-income areas, shifts from more intensive enterprises to livestock and feed crops are desirable from the standpoint of both de-

velopments in technology and prospective increases in needs. Studies in some of the hilly cotton areas indicate possibilities for a severalfold increase in incomes with development of livestock enterprises, new methods of production, and increased size of farms.[13] But financial and tenure problems will be important. These adjustments would mean large increases in the amount of capital invested. They would frequently mean a doubling or more in the size of farm.

In many of these areas research is still needed to formulate the productive alternatives in concrete terms. Sometimes in past studies the levels of management assumed precludes any substantial reorganization of farming. In the context of research in the framework of a developing economy, it would seem necessary to revise such procedures.

In my judgment, we need to look first at what the best opportunities are and then at whether or not the enterprise combinations will call for unusual managerial talents. Actually, new techniques may sometimes simplify the problem of management. Feeding and disease problems may be easier for a 3,000-bird poultry flock now than for a 200-bird family flock under the technology common 20 years ago.

Alternative products must be analyzed in the context of prospective national and local markets. This is particularly important in these areas. Low income areas are replete with examples of the introduction of new products that could be efficiently produced at past prevailing prices but were not successful when grown on an expanded basis. Consequently, the economics of production and marketing becomes an intertwined web in these areas.

Sound farm-development plans in these areas must also recognize the growing cheapness of capital relative to labor.

To the problems already discussed we must add the acute problem of providing a better basis for farm people to make and implement decisions with regard to farm and relatively distant nonfarm employment alternatives. Direct employment in agriculture would be reduced materially if levels of farm income are significantly raised in many of these areas.

Rapid reductions in the number of people engaged in farming occur in some areas even when strictly local nonfarm employment opportunities are not available. The total number of farms in the northeastern Texas sandylands, for example, decreased by more than 40 percent from 1940 to 1950. This reduction largely reflects the increased employment of farmers and farm people in nonfarm jobs in Galveston, Houston, Dallas, and other towns outside the area.

---

[13] D. W. Parvin, *The Nature of An Efficient Agriculture in the Short-Leaf Pine Area of Mississippi*. Bul. No. 457. Nov. 1948. *Nature of an Efficient Agriculture in the N. E. Prairie*, Bul. No. 459, Jan. 1949, *Farm Practices and Organization in the Sand Clay Hills Area*, Bul. No. 466, Sept. 1948.

Pure distance, consequently, is not the only consideration. Factors such as information and ownership are important. Educational and cultural aspects are highly significant. Agricultural developments themselves may be important. Hendrix has pointed out that "in agricultural areas where little progress has been made, the tendency is to identify performance as potentiality."[14] As differences in agricultural earnings become apparent, do people tend to recognize their economic problems more clearly and to consider alternatives more readily?

5. In some areas resources are such that there appears to be relatively little opportunity for productive employment locally, in either agriculture or industry. This raises questions of zoning and the place of recreational and forestry uses of land in a developing economy. Demand for recreation, for example, would appear to be increasing, in view of the projected population of 210 million and a shorter working week by 1975. Perhaps we need to examine more carefully whether use of an area for recreational purposes would be justified or not in the context of our growing economy and what its effect on total employment in such areas will be. Some low-income areas in recreational use, for example, apparently have generated considerable direct employment as well as more productive farm employment in producing products for tourists. Are the employment opportunities of such areas likely to be increased or decreased as compared with probable use in "low-pressure" farming?

Concluding Comments

When we add together the factors associated with the persistence of low-income farming and compare these with developments that have occurred in the last 10 or 15 years, we are confronted with the fact that something is lacking in our analysis.

In a number of instances, changes and developments that have occurred would not be predicted on the basis of the factors we have enumerated. The development of the broiler industry in northern Georgia is one example. Much has been written of developments in the Tupelo, Miss., area. They, perhaps represent another instance. Many of the state extension services can point to one or more areas or counties in which developments have been phenomenal, although the tangible resource situation was similar to that in other counties or areas.

As economists, we must recognize that we still do not know as much as we should know about what is involved in the process of change. More research would appear to be needed on the elements involved in economic progress on the area as well as the individual level. Research of this kind

---

[14] Op. cit., *Journal of Farm Economics*, February 1951.

would evaluate elements involved both where economic progress of farm families has been rapid and where it has been slow.

Further analysis of the conditions found and the steps taken where low-income farmers have developed productive farming systems can provide valuable insight useful to extension workers, private lenders, and the Farmers Home Administration as to the conditions under which successful development of such farms has been possible. Study of counties in which local development programs have been carried on for a number of years may yield useful indications as to the types of economic programs that result in substantial increases in income-earning capacity and living conditions.

SOCIOLOGICAL ASPECTS OF THE LOW-INCOME FARM PROBLEM

OLAF F. LARSON
Cornell University

THIS paper has been prepared with the assumption that although primary attention will be given to farm operators and their families in the United States, the farm labor group may legitimately be considered as a part of the low-income farm problem. It also assumes that other papers in this session and recently issued reports describe in detail the number and distribution of the contemporary low-income farm population and its major demographic and economic characteristics.[1] Accordingly, this paper is limited (a) to some comments on the low-income concept, (b) to a brief analysis of the low-income farm problem in the United States when viewed in historical perspective and (c) to reviewing some implications of sociological theory and research for measures to alleviate the low-income farm problem.

The point of view to be developed may be summarized in this way: (1) Specific agreement remains to be reached on the low-income concept. (2) However conceptualized, the low-income farm group is basically heterogeneous and represents multiple problems. (3) The concentration of low-income farmers in certain "problem areas" has been persistent. (4) The causes of this persistence include certain institutional and cultural barriers to social change. (5) Change to reduce the incidence and the concentration of low-income farmers may be facilitated both by indirect impersonal social forces and by direct action. (6) Sociological theory and research indicates both barriers and aids to effectively working directly with the low-income group.

Concepts

Low income. The concept of "low-income farmer" is itself relatively new, finding little expression in the United States before the early 1930's.[2]

[1] *Development of Agriculture's Human Resources,* A Report on Problems of Low-Income Farmers prepared for the Secretary of Agriculture, U. S. Department of Agriculture, Washington, D.C., April 1955; U. S. Bureau of the Census, *Farms and Farm People—Population, Income and Housing Characteristics by Economic Class of Farm,* U. S. Government Printing Office, Washington, D.C., June 1953; Jackson V. McElveen and Kenneth L. Bachman, *Low Production Farms,* U. S. Department of Agriculture, Bureau of Agricultural Economics, Agriculture Information Bulletin No. 108, Washington, D.C., June 1953; Louis J. Ducoff, *The Hired Farm Working Force of 1952 with Special Information on Migratory Workers,* U. S. Department of Agriculture, Bureau of Agricultural Economics, Washington, D.C., October 1953; U. S. Bureau of the Census, *U. S. Census of Agriculture: 1950,* Vol. V, Special Reports, Part 9, *Economic Class and Type of Farm—A Graphic Summary,* Washington, D.C., 1952; Ronald L. Mighell, *American Agriculture, Its Structure and Place in the Economy,* New York: John Wiley and Sons, Inc., 1955.

[2] Murray R. Benedict, *Farm Policies of the United States, 1790-1950,* New York: The Twentieth Century Fund, 1953, p. 356.

The first problem faced is whether, in a definition, to put emphasis on the farm and the operator as a production unit or upon the operator and his family as a consumption unit.[3] Attempts to consider both farm and family simultaneously raise the perennially difficult question of what is and what is not a *farm* family. If we assume agreement as to what a *farm* family is, there are at least three broad alternative approaches to defining the low-income farm family universe, each with operational and theoretical advantages and disadvantages. These are (1) a given segment, as the "lower one-third," of the families distributed according to some measure of income, (2) the population below a specified income, as $1,000 available for family living, or (3) those whose incomes, regardless of amount or relative position are insufficient to provide the family with the goods and services determined as a desirable minimum.[4] The third approach is a functional one.

Despite agreement for more than two decades on the existence of a low-income farm problem, the literature continues to show considerable variation in the definition of "low-income farmer" and the use of a variety of measures for identifying the individual low-income farmer and for delineating the concentration of such farmers in "problem areas."

The recent report prepared for the Secretary of Agriculture on *Development of Agriculture's Human Resources* reflects the continuing lack of clarification, on at least a theoretical or functional basis, of the low-income concept. The report begins on a *family* basis, stressing the estimated 1.5 million farm operator families, more than one-fourth of the total, (census definition) with a net cash family income from all sources of under $1,000 in 1950.[5] It then shifts to a *farm* basis by indicating that of these 1.5 million families, 1,269,000 are on *small farms* with gross sales in 1949 of less than $2,500. As a further refinement there is next a shift to the characteristics of *the operators* of these small farms, eliminating about 326,000 operators aged 65 and over and about 156,000 younger operators working off-farm 100 days or more, thus leaving an estimated 787,000 small farms with "full-time" operators under 65 whose families netted less than $1,000 cash in 1950. (Parallel estimates are also presented

[3] This parallels the economic concepts of "productive norm" and "distributive norm." See Rainer Schickele, *Agricultural Policy*, New York: McGraw-Hill, 1954, pp. 38-53.

[4] Olaf F. Larson, et al., *Ten Years of Rural Rehabilitation in the United States*, Washington, D.C., U. S. Department of Agriculture, Bureau of Agricultural Economics, July 1947, pp. 92-93 (out of print but issued in summary form in 1951 by Indian Society of Agricultural Economics, Bombay, India).

[5] *Development of Agriculture's Human Resources*, p. 1 and Table 1. These national estimates were apparently developed from a sample of approximately 11,000 farms and associated households in the United States, one-fifth of one percent of all such units (see *Farms and Farm People*, p. 3 and Table 1).

of the families with under $2,000 net cash income; these almost double the numbers in each category.) From a *farm* and *operator* point of view the estimates of the low-income farm problem then are only about half as large as from the point of view of *families* connected in some way with operating a farm. Inclusion of farm wage workers would, of course, increase these estimates of low-income families associated with agriculture.

The criteria used yield impressive results as to the magnitude of the low-income problem from either family or farm points of view. The limitations of available data for estimates on a national basis, and the need for operationally workable procedures are recognized. Nevertheless, it seems important also to appreciate that the criteria of net family income of $1,000 (or of $2,000) is only one of several alternatives and does not necessarily yield the same estimates as would be derived from a more clearly functional approach to defining the low-income farm family.[6]

Problem areas. The recent report for the Secretary of Agriculture uses these criteria to delineate nine generalized problem areas encompassing about one million full-time small-scale farmers of working age: (1) net income from the farm, (2) level of living and (3) size of farm operations.

A much-used comparable delineation is a map published by Taylor and associates in 1938 showing areas in which marked disadvantaging conditions prevailed in American farm life. Six criteria were used on a county basis, with the presence of any one qualifying a county as disadvantaged: "In this map are combined the areas in which 50 percent or more of the farms yielded less than $600 farm income in 1929; areas in which 50 percent or more of all gainfully employed in agriculture were hired laborers in 1930; areas in which 50 percent or more of all farms were tenant or cropper farms in 1930; areas in which 20 percent or more of the farms

---

[6] Examples of such approaches are given in: Lloyd H. Fisher, "What is a Minimum Adequate Farm Income," *This Journal*, Vol. XXV, No. 3, pp. 662-670 (August 1943); T. Wilson Longmore and Carl C. Taylor, "Elasticities of Expenditures for Farm Family Living, Farm Production, and Savings, United States, 1946," *This Journal*, Vol. XXXIII, No. 1, February, 1951; Donald R. Rush and Olaf F. Larson, *Farm Resources and Farming Systems Needed to Meet Living Needs of Farm Families in Five Type-of-Farming Areas*, Part I—Summary, U. S. Department of Agriculture, Bureau of Agricultural Economics, Washington, D.C., March 1942 (out of print); *Standards and Levels of Living*, Columbia Basin Joint Investigations, Studies by the U. S. Department of Agriculture for Problem 9, U. S. Department of the Interior, Bureau of Reclamation, Washington, D.C., 1947; Eunice M. Knapp, "City Worker's Family Budget for October 1951," *Monthly Labor Review*, U .S. Department of Labor, Bureau of Labor Statistics, Vol. 74, No. 5, pp. 520-522, May 1952. (The BLS estimates of the cost of a modest but adequate level of living for a 4-person large-city worker's family in 1951—based in part upon scientific standards, experts' standards and consumer preference—ranged from $3,812 in New Orleans to $4,454 in Washington, D.C., Families on small farms also average about 4 persons.)

should be replaced because of maladjustment in land uses; areas that had lost all their natural increase in population between 1920 and 1930 and in addition had lost 20 percent of their 1920 population; areas in which 30 percent or more of the total population was on relief in June 1935; and areas in which 20 percent or less had standard of living facilities as measured by an index combining electricity, telephones, radios, automobiles, and water piped to the dwelling."[7]

Many other maps have been prepared for several decades, based largely on Census of Agriculture data, which have been interpreted as indicating rural problem areas of low production, low income, and low family levels of living.

Historical Perspectives

Trends in number. There are many limitations in any attempt to determine precisely national trends in the number of low-income farm families due to lack of data on family income, difficulties in correlating population and agricultural census data for farm and family, changing price levels, and variations in the concept of what should be called "low income." Accepting the calculation by McElveen and Bachman that a $2,500 value of sales limit as of the 1950 Census was equivalent to $1,000 gross value of farm products as of the 1930 census (after adjustment for farm prices and output per man hour)[8] shows an increase from nearly 3 million low production farms in 1930 (49 percent of the total) to 3.3 million (61 percent of the total) in 1950. This apparent increase, of course, is unrealistic as far as both families and agriculture are concerned because the data pertain to farm and not to family income and include many whose relation with agriculture is marginal. More realistic from both family and farm points of view, especially the latter, are McElveen and Bachman's estimates that the number of small-family and small-scale farms (operators essentially full-time on their own farm and with sales under $2,500 at 1950 price levels) dropped from 2.2 million in 1930 to 1.7 million in 1950, almost a half million or 21 percent decrease.[9] As a percentage of all farms, this 1930-1950 change represented only a slight drop, from 35 to 32 percent, while omitting part-time and residential farmers from the base shows a slight increase in small farms as a percentage of commercial farms, from 42 to 44 percent. Such crude data indicate some absolute gains in decreasing low-income families within American agriculture but also suggest that the relative proportion had not changed

[7] Carl C. Taylor, Helen W. Wheeler and E. L. Kirkpatrick, *Disadvantaged Classes in American Agriculture*, U. S. Department of Agriculture, The Farm Security Administration and the Bureau of Agricultural Economics cooperating, Social Research Report No. VIII, Washington, D.C., April 1938, Figure 33, p. 123.

[8] McElveen and Bachman, *op. cit.*, p. 59.

[9] *Ibid.*, Table 4, p. 6.

substantially by 1950. Such conclusions could well lead back to questions of the low-income concept, of techniques for measurement, as well as to fundamental questions of distributive norms.[10] But let us move to considering trends in the distribution of whoever are defined as low-income farm families.

Trends in distribution. One might contend that in any open-class, open-economy society it is "normal" to have a certain proportion of farm families in a low-income group both apart from and in conjunction with the economic concept of the contributive principle of the income distribution norm.[11] For example, there are the "normal" proportions of the physically and mentally handicapped whose productivity is so reduced that they are expected to fall in the low-income category. Several studies have shown that the economic status of farm families is related to the stage of the family cycle.[12] It may be assumed that farm families in low-income status due to such "normal" causes would be rather equitably distributed throughout the nation. As of 1950, however, the report to the Secretary conclusively shows a concentration of low-income families and farms that cannot be a function of "normal" personal and family characteristics.

It is highly significant that agriculture's problem areas of 1950 are almost identical with the problem areas, whatever the criteria used, for the past half century. Compare the 1950 areas with the location of standard rural rehabilitation borrowers 1935-1943,[13] the counties having an estimated 200 or more full-time, able-bodied working age unproductively employed farm operators in 1940,[14] counties having two or more marked disadvantaging farm conditions as of 1930 (Taylor, Wheeler and Kirkpatrick), low value-of-farm products farms in 1929,[15] low planes of living 1928-1929,[16] small farms in 1920,[17] acres of improved land per farm in

---

[10] See Schickele, *op. cit.*, pp. 51-52.

[11] See Schickele, *op. cit.*, p. 49.

[12] Several of these are summarized in Lowry Nelson, *Rural Sociology*, New York: American Book Company, Second edition, 1955, pp. 307-312 and in Charles P. Loomis and J. Allan Beegle, *Rural Social Systems*, New York: Prentice-Hall, Inc., 1950, pp. 77-87.

[13] Larson, *op. cit.*, Figures 3 and 4.

[14] Conrad Taeuber, *Rural Manpower and War Production*, U. S. Department of Agriculture, Bureau of Agricultural Economics (Testimony given before the Select Committee Investigating National Defense Migration, House of Representatives, February 13, 1942) Mimeographed.

[15] O. E. Baker, *A Graphic Summary of the Number, Size and Type of Farm, and Value of Products*, U. S. Department of Agriculture, Misc. Pub. No. 266, Washington, D.C., October 1937, pp. 68-69.

[16] Carter Goodrich, Bushrod W. Allin and Marion Hayes, *Migration and Planes of Living 1920-1934*, Philadelphia, University of Pennsylvania Press, 1935, figure opposite p. 10.

[17] O. E. Baker, "A Graphic Summary of American Agriculture Based Largely on the Census of 1920," in *Yearbook of the Department of Agriculture, 1921*, pp. 490-491.

1910[18] and similar delineations. The conclusion is clear that the concentration of low-income farm families in certain areas has been remarkably stable and persistent except for temporary crises experienced during drouth and depression by farmers in the Great Plains. This leads to questions of causes and suggests implications for programs that would even out this persistent concentration.

One would grant the importance in these problem areas of limited land resources in relation to population, of limited opportunities for off-farm work within the areas, of limited application of improved farm technology and of low educational achievements.[19] Yet these do not fully explain the long-time concentration. Why have the problem areas persisted? Do they have some characteristics that would lead us to expect them to be problem areas in the year 2000?

Among the several major value-orientations in American culture that serve as guides to choices that people make individually and collectively are listed: (1) a central stress upon personal achievement, especially secular occupational achievement, (2) efficiency and practicality, (3) progress, (4) material comfort, (5) external conformity and (6) belief in science and secular rationality.[20] To the extent that these values are shared by the low-income group, motivation would be expected for an improvement in status. Thus knowledge of new agricultural techniques to improve income would lead to adoption. Or knowledge of alternative opportunities would lead to occupational shifts or migration. The record shows that such responses have been substantial. Yet the problem areas persist.

Possibly isolation and ineffective communication have delayed and resulted in a differential diffusion of knowledge about the alternatives. Certainly the lowest income farm families (under $1,000 family income and Class V and VI farms) were generally more isolated and more lacking in facilities for mass and point-to-point communication as of 1950 than were higher income families. The report on *Farms and Farm People* shows 45 percent of the under $1,000 families living on dirt or unimproved roads against about 20 percent for the $4,000 and over group,[21] 62 percent with electricity (an aid to radio) on the farm versus more than 90 percent for the higher income group, and 18 percent with telephones compared with more than 60 percent for those with $4,000 and over. Possibly, lack of economic resources has been a barrier to making farm adjustments or occupational or residential shifts. Surely poverty has

[18] Middleton Smith, O. E. Baker and R. G. Hainsworth, "A Graphic Summary of American Agriculture" in *Yearbook of the Department of Agriculture, 1915*, p. 343.

[19] *Development of Agriculture's Human Resources*, pp. 8-11 and Tables 3 and 4.

[20] Consult Robin M. Williams, *American Society*, New York: Alfred A. Knopf, 1951, pp. 388-440.

[21] Table 4, pp. 79-83. For data by economic class of farm, see Table 3, pp. 74-78.

some self-perpetuating qualities as in the case of the low-income family that handicaps its children by limiting their education because of low income, or as seen from the well-documented evidence that low-income farm people are disadvantaged as to the use of health resources for their children.

However, an observation of the outstanding characteristics of the problem areas suggests that among the basic causes of the long persistence of the rural problem areas of the nation are their institutional and cultural patterns or what have been called "social systems."[22] That 80 percent of the nation's sharecroppers, but only 46 percent of all farms and 38 percent of the commercial farms are in the generalized problem areas implies the importance of a complex of behavior patterns associated with land tenure institutions. The majority of the nation's rural population sometimes referred to as "minority groups"—Negroes, Spanish-speaking and Indians—live within the problem areas. Nonwhites make up 30 percent or more of the rural farm population in five of the nine generalized areas. The whole set of social relationships associated with these minorities is one of the institutionalized causes of the present low-income situation. It is not chance that the five areas high in nonwhites are also highest in percentage of adult rural farm population with less than 8 years of school (from 53 to 73 percent compared with 27 percent for the rural farm population outside of the problem areas.)[23] Some parts of the problem areas are characterized as having a familistic society,[24] with kinship structures and with values that have adversely affected occupational and residential choices and adjustments for an improvement of income. Fertility ratios and replacement rates are above the national average in most of the problem areas, again a reflection of values and family systems.

A recital of such facts is evidence of the deepseated changes in human behavior, in values and attitudes that will need to be made to reduce effectively the concentration of the low-income farm population.

Implications of Sociological Theory and Research

The rehabilitation process and social change. Programs to help the low-income farmer are basically concerned with the broad social process of social or cultural change. At the family level, this involves what the writer

---

[22] This concept is used by Charles P. Loomis and J. Allan Beegle, *Rural Social Systems, op. cit.*, pp. 3-36.

[23] *Development of Agriculture's Human Resources*, p. 44.

[24] James S. Brown, *The Farm Family in a Kentucky Mountain Neighborhood*, Kentucky Agricultural Experiment Station Bulletin 587, August 1952 and *The Family Group in a Kentucky Mountain Farming Community*, Kentucky Agricultural Experiment Station Bulletin 588, June 1952.

has previously termed the rehabilitation process (for many the term "habilitation" would be more apt), the process of attaining a cluster of interrelated economic and social goals whose content is expressed in terms of practices, behavior patterns, attitudes and material possessions.[25] The many studies[26] of thousands of low-income families who have participated in rehabilitation programs in the past make clear two points that are important for the success of such programs and for successful work of personnel responsible for conducting the programs. First is the necessity of understanding that the rehabilitation process involves changes in individuals, in their behavior, attitudes and sometimes values. Second, the speed of the rehabilitation process is conditioned by a complex of variables, (a) by the characteristics of the family and its members, (b) by the physical and economic resources available to the family, (c) by the rehabilitation aids, (d) by the culture—especially as expressed by attitudes, values, class structure, social and economic institutions and facilities—within which the family lives and (e) by impersonal forces such as economic and technological change, or natural calamities that are outside the control of the family or a rehabilitation program.[27] An understanding of the process leads to the following principles: (1) Setting a definite time limit within which all families must achieve rehabilitation, is incompatible with the nature of the rehabilitation process. In general, the lower the economic and social level at the time of starting, the longer and the more difficult it is for a family to achieve rehabilitation. (2) The more foreign are the basic assumptions and major objectives of rehabilitation to the local culture, the more difficult is the rehabilitation of individual families within that culture.

Complex of problems. An analysis of the characteristics of low-income families in agriculture suggests that there is not one low-income problem but many. The families are heterogeneous as to characteristics, as to primary causes of their low-income status and as to potentialities for improvement. For example, the migrant farm wage worker constitutes a different category of low-income problem than the cropper, the owner on a poor, subsistence farm, or the owner with assets depleted by natural

---

[25] Olaf F. Larson, "Rural Rehabilitation—Theory and Practice," *Rural Sociology*, Vol. 12, No. 3, pp. 223-237, September 1947.

[26] Most of these studies are listed in John M. McNeil, compiler, *Rehabilitation of Low-Income Farmers, A List of References*, U. S. Department of Agriculture, Library List No. 6, Washington, D.C., August 1943 and Elizabeth Gould Davis, compiler, *Low-Income Farm People, A Selected List of References*, U. S. Department of Agriculture, Library List No. 62, Washington, D.C., May 1955.

[27] The rehabilitation process is analyzed in Larson, *Ten Years of Rural Rehabilitation in the United States*, pp. 331-345.

calamity.[28] Careful study of many of these families shows that a complex of problems, rather than a single problem, is characteristic. These family problems may be grouped under such major headings as "physical resources to produce income and protect health, skills and abilities to use resources, institutional arrangements, personal traits, social relationships, and credit."[29] An inadequate land base and insufficient credit are but two items in the *bundle of barriers* to substantial improvement in the income level of many farm families. Recognition of the several categories of low-income farm families and of the existence of multiple problems within families underscores the need for a broad and flexible approach in policies and programs to aid this group, including—at the family level—an individualized case-method approach of diagnosis and treatment.

Impersonal forces. Impersonal forces not only influence the speed and permanence of raising the level of the individual family but may work counter to (or in support of) programs directly aimed at the low-income group. Public policy puts some of these forces into operation. Certainly continued high-level nonfarm employment or shifts in the location of industrial production are of consequence for the number and concentration of low-income farmers. Further mechanization in the Cotton Belt can be expected to affect large numbers traditionally in the low-income category.[30] The raising of minimum wages under the Wages and Hours Act and the spread of guaranteed annual wage plans should pull more workers out of the low-income farm areas. The extension of Old Age and Survivors' Insurance to farm operators should offer an opportunity for farm consolidation and enlargement and for more favorable procedures for transferring farms within families, all to the advantage of those with low incomes. The broad trend of court decisions relative to access to public services,[31] such as the Supreme Court decisions of May 17, 1954 and May 21, 1955 relative to segregation in public schools, may have long-range effects in reducing the low-income farm population. A broadening and increasing of federal aid to education and programs to improve the use of health resources by rural people might have considerable effect in the future on the trends in the low-income farm group.

On the whole, the net impact of the major foreseeable impersonal forces

---

[28] This view is also expressed by Benedict, *op. cit.*, p. 357.

[29] Larson, *Ten Years of Rural Rehabilitation in the United States*, pp. 128-129.

[30] Harold A. Pedersen and Arthur F. Raper, *The Cotton Plantation in Transition*, Mississippi Agricultural Experiment Station Bulletin 508, January 1954; Harold A. Pedersen "Mechanized Agriculture and the Farm Laborer," *Rural Sociology*, Vol. 19, No. 2, pp. 143-151 (June 1954).

[31] For cases, see Milton R. Konvitz, *Bill of Rights Reader; Leading Constitutional Cases*, Ithaca, New York: Cornell University Press, 1954, pp. 527-558.

seems to be on the side of helping the low-income farmer. The response would seem to be influenced greatly by the extent to which individuals share the basic American value orientations mentioned or, in fact, constitute a series of subcultures with values that will inhibit a favorable and "rational" response.

Direct-aid programs. Experience has demonstrated that low-income families who think of themselves as low status, or are so identified by the community in which they live, are the most difficult segment of the farm population to help effectively and efficiently through voluntary programs. Research studies have shown repeatedly that social status is one of the major variables related to participation in formal organizations, to use of sources of information about new farm and home practices, to adoption of farm and home practices, to use of the extension service, to aspirations for children, and to a host of other forms of behavior, attitudes and values.[32] Thus, low status is itself a major barrier to be overcome by programs that work directly with the low-income farm group.

Other sociological research not directly concerned with low-income families also offers suggestions for increasing the effectiveness of work with this group. Here one can only list such research areas from which application may be made as: social structure including informal groups, reference groups and leadership; diffusion of farm and home practices, communication of new ideas about farming and homemaking, values and attitudes, motivation and decision-making, and what is being called "community development" where the emphasis is on organizational processes.[33]

Training. Finally, the emphasis of this paper on the complexity of the low-income problem and its relation to basic cultural and institutional phenomena leads to the need for adequate training for personnel of any action program. The key professional person in an action program is the worker who comes in direct contact with families and communities. This was particularly demonstrated in the experimental program during 1938-42 in 10 counties in which work was done with some 600 families below the level of acceptance of the regular rehabilitation program.[34]

---

[32] For an excellent general analysis see Williams, *op. cit.*, pp. 78-135. A review of several studies is given in Harold F. Kaufman, Otis Dudley Duncan, Neal Gross and William H. Sewell "Problems of Theory and Method in the Study of Social Stratification in Rural Society," *Rural Sociology*, Vol. 18, No. 1, pp. 12-24 (March 1953).

[33] Many of these research studies are published in *Rural Sociology*, or are reviewed in the book and bulletin review sections of *Rural Sociology*.

[34] This experiment is summarized in Rachel Rowe Swiger and Olaf F. Larson, *Climbing Toward Security*, U. S. Department of Agriculture, Bureau of Agricultural Economics, Washington, D.C., November 1944 (out of print) and in Larson, *Ten Years of Rural Rehabilitation in the United States*, pp. 285-291.

The complexity of the problems of low-income families, if accompanied by a corresponding flexibility in techniques of aid, requires the professional to take a number of difficult roles. He is an educator giving farm and home management advice. If credit is one of the program tools, he must play a banker's role. He must be a family case worker and he may have to be a community organizer. To be adequate to take these roles and to be skilled in keeping them in appropriate balance is not easy. A serious effort to conduct an expanded attack on the low-income farm problem should be accompanied by increased attention to training personnel.

PART-TIME FARMING AND THE LOW-INCOME FARM PROBLEM*

CHARLES E. BISHOP**
North Carolina State College

THE topic assigned to me has different meanings to different people. There is no general agreement, even among economists, as to what constitutes a low-income problem. There seems to be even less consistency in the definition of a part-time farm.

The concepts of a part-time farm and of a low-income farm family involve classification of farm families into groups. Thus the relation of part-time farming to the low-income problem obviously will be influenced by the selection of attributes used in the classification of part-time farms and of low-income farm families. With this in mind, I shall first examine the low-income problem from an economic viewpoint, second, discuss the economic rationale of part-time farming, and third, indicate some effects of part-time farming on the distribution of income among resource owners.

The Low-Income Problem in an Economic Context

Among economists, there seems to be almost unanimity in the acceptance of poverty as a relative concept. Incomes of persons are low in relation to the incomes of other persons or in relation to their own income potential. In the first context, incomes are low in terms of the personal distribution of income. Incomes of persons may be low in relation to incomes of other persons, however, without indicating that changes in resource use would lead to a more efficient use of resources. In this paper, I shall not consider such cases.

On the other hand, when incomes of persons are low in relation to their income potential, incomes are low in terms of the functional distribution of income. The implication is that payments to owners for the services of resources that they control could be increased by a reallocation of resources among uses. In this context, low incomes are a symptom of inefficiency in resource use.

Inefficiency is defined with respect to time and the state of knowledge. At any point in time, a person's income is low in relation to his income potential when by a reallocation of the specified kinds and quantities of resources under his control he could increase the returns for the services

---

* Contribution from the Department of Agricultural Economics, North Carolina Agricultural Experiment Station, Raleigh, North Carolina. Published with the approval of the Director of Research as Paper No. 669 of the Journal Series.

** In the development of this paper I have benefited from the suggestions of B. A. Hannush, R. A. King, W. W. McPherson, and J. C. Williamson of North Carolina State College.

of his resources. From the standpoint of farmers and policy makers an income problem of perhaps even greater significance than changes in resource use concerns the effects on productivity of changes over time in the kinds and quantities of resources controlled.

Economic efficiency must also be defined with respect to the state of knowledge of decision makers. In the means-ends schema, choices are made in the pursuit of ends. If one accepts the rationality postulate, choices must be evaluated with respect to their consequences. Based on his interpretation of the conditions with which he is confronted, a resource owner will make choices consistent with his objectives. Hence, from the standpoint of resource owners, inefficiency can exist, or real incomes are lower than potential incomes, only if there is imperfect knowledge regarding the consequences of alternative uses of resources or if capital limitations and other barriers restrict the decision maker in the realization of the productive potential of resources available to him.[1] With this definition incomes of persons are not low unless it is known that more productive alternative uses exist for the resources controlled by them.

To economists interested in promoting efficiency in resource use, classification of farm families by size of income provides little useful information. At most, all that can be obtained from such information is a basis for classifying populations that are to be studied to determine whether or not alternatives exist that likely would lead to an improvement in aggregate productivity and in incomes.

The Economic Rationale of Part-Time Farming as a Means of Resource Use

Now that a low-income problem has been defined, it is necessary to examine the nature of part-time farming before discussing the relation of part-time farming to low-incomes of farm families. In the most general sense, part-time farming involves the combination of farm and off-farm uses of labor resources controlled by one household or decision making unit. In the *1950 Census of Agriculture,* farms were classified as part-time farms if the value of farm products sold from the farm was between $250 and $1,199, and if the operator worked off the farm for 100 days or more, or if the income that the family received from off-farm sources exceeded the income received from the sale of farm products. From the viewpoint of economic analysis, there are many obvious weaknesses in this definition. Among the more important weaknesses is the overemphasis that

---

[1] C. E. Bishop, "Underemployment of Labor in Southeastern Agriculture," *Journal of Farm Economics,* Vol. XXXVI, No. 2, p. 259.

the definition places on the off-farm work of the farm operator. In the Piedmont, for example, a common practice is for the operator's wife or children to work in a textile plant. Another weakness is the fact that classification is based on *off-farm* rather than *nonfarm* employment and income. Income received from other farms is regarded as income from off-farm sources. Thus on multiple-unit farms, if the landlord sold between $250 and $1,199 worth of products from the "home farm" and received more than 50 per cent of his income from crops and livestock produced by tenants, or from other sources, the farm would be classified as a part-time farm. In addition, the definition is weak in restricting part-time farms to a range of value of farm products sold between $250 and $1,199.

The criteria used in the classification of farms as part-time farms obviously will affect the results one gets from studies of part-time farming. In order to be most meaningful, therefore, classification must be made with respect to the questions being analyzed.

Until recently part-time farming has been looked upon largely as a shock absorber for shifts in the demand for labor in the nonfarm sectors of the economy. This has affected the selection of problems investigated and the classification of part-time farms. During the wave of part-time farming studies conducted in the 1930's for example, much emphasis was placed on the competition of part-time farmers with commercial farmers in product and factor markets.[2] It has now become apparent, however, that part-time farming is not merely a transitory phenomenon.

From the standpoint of economic analysis, part-time farming involves the principles of choice of products to be produced. In a broad sense, the conditions under which a farm family may be expected to engage in part-time farming are essentially the same as the conditions under which any other use of resources will be selected.[3]

As social scientists, our primary interest in part-time farming is to describe and analyze the role that it plays in the socio-economic development of our economy. In the broadest sense, we are concerned with the way in which part-time farming affects aggregative production possibilities and the choice of products. Hence, we are concerned with the manner in which part-time farming (1) affects the aggregate quantity of resource services and the allocation of resource services among uses, (2) affects

[2] L. A. Salter, Jr. and L. F. Diehl, "Part-Time Farming Research," *Journal of Farm Economics*, Vol. XXII, No. 3, p. 584.

[3] If there is any difference in full-time and part-time farming from the standpoint of product choice it is the fact that labor tends to be allocated to nonfarm employment in somewhat larger discontinuous units than to farm enterprises. An industrial entrepreneur desires a commitment of a specified minimum quantity of labor whether or not it is used.

social participation, the transmission of information, and motivation of decision makers, and (3) affects consumption patterns.

Moreover, we are concerned with these questions not only from the standpoint of a particular point in time, but in regard to the effects that the growth of part-time farming has on the long-term productive potential of our economic system. Hence, we are also concerned with the effects of part-time farming on birth rates, factor mobility, and industrial location.

Since our interest in part-time farming is primarily from the standpoint of the effects of the combination of farm and nonfarm uses of labor upon particular economic and social variables, research in part-time farming can be facilitated if part-time farms are classified on the basis of some minimum quantity of farm family labor used in nonfarm employment.[4]

Some Effects of Part-Time Farming on the Distribution of Income

In the sense in which I have used the term, part-time farming involves both farm and nonfarm uses of labor resources. Thus, local industrial development is a prerequisite to part-time farming. The question of the effects of part-time farming upon incomes of farm families in low-income areas, therefore, becomes a question of whether or not nonfarm industries are likely to locate in areas that have low-income farm families and, if so, what the effects of local industrialization are likely to be on the use and returns for resource services as compared with alternative uses.

Numerous studies have demonstrated that incomes of farm families are positively correlated with nonfarm employment. Schultz in the provocative paper presented before this association at the annual meetings in 1949, illustrated the manner in which industrial development in a region may influence the course of economic events in that region as compared with other regions.[5] Very little effort, however, has been devoted to study of the conditions necessary for industrial development in rural areas.

Resource use in an area is not independent of the institutional environment within which allocative decisions are made. There are two major types of economic organization of agriculture in low-income areas of the South. In some areas farms are largely owner-operated and the owner and his family own essentially all of the resources used in farming. In other areas a large proportion of the farms are organized as multiple-unit operations and resource control is divided among tenants, croppers,

[4] Research from published sources of data such as the census reports can be improved if nonfarm employment is regarded as an independent variable and other variables in which social scientists are interested are related to the amount of family labor employed in nonfarm occupations.

[5] T. W. Schultz, "Reflections on Poverty Within Agriculture," *Journal of Political Economy*, Vol. LVIII, No. 1, pp. 1-15.

or wage workers, and landlords. The effects of industrial development in an area characterized by owner-operated farms is different from the effects in an area characterized by a multiple-unit type of agricultural organization.

Nonfarm development and part-time farming will have a different appeal to the different groups in agricultural areas. Industralization will be opposed by those whose socio-economic position is likely to be damaged. In fact, some studies indicate that industrial development will be postponed as long as those who oppose it have sufficient power to prevent industrial growth. Moore, in his study, "Industrialization and Labor," concludes that there is a rough proportionality between the prestige of innovators and acceptability of change in a society.[6]

Attitudes of local residents toward industrialization are an important factor in decisions regarding industrial location.[7] In the selection of sites for location of plants, industrial entrepreneurs likely will consider total cost with respect to output over the expected range of operation at alternative locations. Attitudes of local resource owners will influence expected costs and location decisions.

Industrial development in low-income areas has been greatest in areas with a relatively dense farm population and with a high proportion of owner-operated farms. These areas have been characterized by large quantities of labor that were not employed in income-generating uses. Hence, industry has located in areas where large quantities of labor could be attracted from farms to nonfarm production without disrupting the agricultural organization. In other words, much of the industrial development in low-income areas has been in areas where nonfarm employment is largely supplementary to farm employment.

Even in these areas, however, continued expansion of nonfarm employment has resulted in the transfer of labor from farm to nonfarm employment in the competitive region and has caused some change in agricultural production. In the Northern Piedmont Area of North Carolina, for example, tobacco allotments currently are underplanted in large quantities in spite of the fact that the allotments are quite effective on farms in areas that are not so highly industrialized.[8] Industrial expansion has changed the supply of labor to agriculture and the production of tobacco,

[6] Wilbert E. Moore, *Industrialization and Labor,* Cornell University Press, 1951, p. 41.

[7] G. E. McLaughlin and Stefan Robock, *Why Industry Moves South,* N.P.A. Committee of the South, p. 105.

[8] C. E. Bishop, W. R. Henry, and A. L. Finkner, *Underplanting Tobacco Allotments: Factors Affecting Tobacco Planting Decisions in Forsyth County and the Northern Piedmont,* A. E. Information Series 42, North Carolina State College, March, 1955.

an enterprise that employs relatively large amounts of labor per dollar value of output, has been decreased.

Ruttan has shown that the major impact of industrial development of rural areas is exerted through the labor market.[9] As a result of the shift in the supply of labor, changes in farm production take place that alter the functional distribution of agricultural income. Payments at the margin for the services of labor in agriculture are increased in relation to payments for the services of land. In fact, if the resource transfer occurs in the competitive region net revenue from farming may be decreased. However, if the agricultural organization is characterized by owner-operated family-type farms, the personal incomes of farmers will clearly increase as a result of the changes in resource use.

The effects of superimposing part-time farming on a rural community in which agricultural production is organized on a hired labor basis or on a multiple-unit basis are not defined so clearly. Nonfarm development and part-time farming are negatively correlated with tenancy and the per cent of nonwhites in the farm population. Ruttan and Pugh have shown that in the South the per cent of the farm population nonwhite is positively correlated with the per cent of the population rural-farm and the per cent of the farmers who are tenants.[10] The nonwhite and tenant population is concentrated in areas in which cotton, tobacco and other crops that require large amounts of labor in relation to land constitute major sources of income. The fact that industrialization and part-time farming have developed slowly in such areas suggests that conditions in these areas have not been conducive to industrial expansion. If there are conditions in the agricultural organization *as such* that would impede industrial development one should be able to isolate these by study of the likely effects of industrial development on the use of resources and on the distribution of income in such areas.

The operator on a multiple-unit farm varies the amount of labor on the farm according to expected labor productivity. A landlord prefers to have large families and few families. When large families are obtained this reduces the cost of supervision and the cost of housing to the landlord. Additional families mean additional expense. Hence, an additional cropper family is hired only if the additional labor will increase the net revenue to the operator of the multiple-unit farm.

---

[9] Vernon W. Ruttan, "The Impact of Urban-Industrial Development of Agriculture in the Tennessee Valley and the Southeast," *Journal of Farm Economics*, Vol. XXXVII, No. 1, p. 47.

[10] Ruttan, *op. cit.*, p. 47.

C. R. Pugh, "Factors Influencing Level of Income and Income Distribution in the Northern Piedmont Area of North Carolina," unpublished dissertation, North Carolina State College, 1955.

The amount of a crop that a landlord is willing to permit a cropper to produce is usually determined by the amount the cropper family can be expected to tend during peak work periods. When a worker from a cropper family obtains full-time nonfarm work, therefore, the transfer from farm to nonfarm employment occurs in the competitive region. The supply of labor to the farm is decreased and there is a tendency to decrease the production of farm commodities.

Clearly the return that the cropper family receives from its resources will be increased by the transfer of a part of its labor resources to nonfarm employment. Otherwise, the transfer would not take place. A conflict of interests may arise, however, between cropper and landlord. If the supply of labor to a multiple-unit operator is perfectly elastic, cropper families who insist on using part of their labor in nonfarm employment during peak farm labor requirement periods will be forced to transfer to nonfarm residences.

On the other hand, if a transfer of labor from farm to nonfarm employment increases the price of farm labor, the optimum factor proportions in the production of farm commodities is changed and there will be a tendency to decrease the production of those commodities that use large amounts of labor in relation to value of output. When the quantity of labor is decreased in relation to other resources, the marginal productivity of labor tends to increase relative to the marginal productivity of other resources. Hence there is a tendency to increase the incomes of labor owners relative to the incomes of nonlabor resource owners.

The price elasticity of demand for those commodities for which production is decreased must be considered, however, in determining the effect on the landlord's net revenue of a reduction in the supply of farm labor. If the price elasticity of demand is less than the elasticity of substitution of other resource services for labor in the production of these commodities, landlords in the aggregate will actually gain, after the long-run, since the increase in the price of products more than offsets the increase in price of farm labor. This does not appear to be a realistic assumption, however, for the major commodities produced on multiple-unit farms in the South. Although the price elasticity of tobacco and cotton are generally considered to be low under present price and production conditions, the technological conditions of production are such that the elasticity of substitution of capital for labor in the production of these commodities has been very low. We may expect, therefore, that with existing technology operators of multiple-unit farms would incur losses as a result of industrialization and an expansion of part-time farming. In the long run if production technology is changed or if the residence value of land is increased, landlords could gain.

In summary, industrial development and part-time farming are likely

to increase the returns for labor services in relation to the returns for other resource services in agriculture. Hence the personal distribution of income to labor owners is likely to be increased in relation to that of owners of nonlabor resources. It is likely that, at least in the early stages of industrial development when the supply of labor to agriculture is highly elastic, the transfer of labor from farm to nonfarm employment through migration will exert more influence on the incomes of low-income farm families in an area characterized by a multiple-unit type of agricultural organization than it will in an area characterized by part-time farming.

The introduction of nonfarm employment into a farm community, however, does not necessarily provide a solution for the low incomes of farm families. In a paper presented before this association last year, I developed some conditions under which industrial development in low-income areas may, in fact, tend to stabilize relatively low incomes in one area as compared with incomes in other areas.[11] Briefly, the argument was that firms that locate in low-income rural areas are usually characterized by highly unstable conditions in product markets. The location of plants in rural areas, where the supply of labor is highly elastic to individual firms, enables these firms to transfer the risk of changes in the product markets to suppliers of labor. This has resulted in relatively high instability in nonfarm employment in areas of low-income farms. Decisions with respect to the migration of labor from farm to nonfarm residences based upon conditions in this economic environment may impede the transfer of labor to more productive uses. Hence, the introduction of industry into farming communities characterized by low-income farms may not be sufficient to solve the low-income problem. Local nonfarm employment is only one of many possible uses of farm labor. There is no reason why this use should be optimal. From the standpoint of national economic efficiency, industrial development in low-income areas, when pursued as an end, may actually result in private gain to the industrialists, but in large social cost to the nation.

[11] C. E. Bishop, "Economic Development and Adjustments in Southeastern Low-Income Agriculture," *Journal of Farm Economics*, Vol. XXXVI, No. 5, pp. 1151-57.

DISCUSSION: THE LOW-INCOME FARM PROBLEM

H. R. MOORE
Ohio State University

The foregoing papers have discussed the low-income farm problem from four vantage points. They have provided a description (1) of the population characteristics of the low-income farm areas, (2) of the economic aspects, (3) of some of the sociological aspects, and (4) of the role of part-time farming as it

may relate to the socio-economic development of low-income farm areas.

We have low-income farmers in all areas. No region is an agricultural utopia for all its farmers. The present discussion centers primarily on those areas where a substantial share of the farm population is characterized as chronically low income as compared with the rest of the United States.

My assignment is to discuss Bachman's paper, "Economics of the Low-Income Farm Problem," and Bishop's paper "Part-Time Farming and the Low-Income Farm Problem."

Bachman cites certain evidence to indicate (1) that individuals with low incomes are disproportionately numerous in agriculture, (2) that substantial progress has been made in absolute terms, and (3) that in relative terms the picture is not too bright, particularly in respect to low-income commercial farms. Thirty years of marked improvements in agricultural methods and 15 years of a full employment economy have not solved the problem of the low-income farmer. As he points out, economic processes have not functioned to bring about adequate adjustments in resource use.

At this point it becomes evident that the low-income farm problem is not just an economic problem.

Bachman points out that our prospective national growth will tend to increase incomes of the low-income farmer group. As a generality that may be true. But it is questionable that the relative position of many low-income farmers would be bettered. If we may generalize from the experience of the past 15 to 30 years, technological changes and mechanization have lowered production costs more on our good lands than on our poorer lands. Our future requirements for farm products probably can be met most efficiently by intensification of production on our better lands usually occupied by farmers in the higher income group. This is a point that might have been discussed more fully. This is a question of reconciling marginal costs with a projected land use pattern based on national needs. The broad implications should be faced as part of the low-income farm problem.

Continued prosperity in agriculture, if present trends in technology continue, is dependent on a large net movement of people from agriculture to nonfarm occupations. As Bachman points out, automation could effect the kind and volume of employment opportunities and upset remedial measures geared to efficient production in agriculture. The implication could be serious. Only two decades ago (but in a depression economy) some people had concluded that we had too large a labor force, that small subsistence farm units were becoming a necessity.

An important point that Bachman makes is the diversity of the low-income farm problem. In different areas the causes are rooted in different situations or combination of situations: land poorly adapted to machinery; crops not easily adapted to mechanization; poor financial position and inability to bear risk; the uneven development of industry; institutional as well as individual poverty; low level of managerial ability.

Again may I point out that a discussion of the economics of the low-income farm problem can not very well avoid some mention of the cultural patterns associated with low income.

An important contribution in Bachman's paper is a description of the problem in certain geographical areas and the appropriate remedies.

These remedies, as either expressed or implied, would include some action relating to (1) industrialization, (2) migration, (3) education, (4) health, (5) farm

reorganization, (6) credit, (7) shifting land from agriculture to some other use or uses, and (8) part-time farming.

The point is that an organized attack on the economic problem of low-income farming involves action by many institutions, organizations, and individuals. It involves planning for the healthy development of whole areas and regions, each with its own combination of circumstances. It includes a great deal more than agriculture.

There is one sentence in Bachman's closing comments that tempers all the rest of his remarks: "More research would appear to be needed on the elements involved in economic progress on the area as well as the individual level."

Part-time farming and the low-income farm problem. Bishop, as well as others, has noted the difficulty over the definition of part-time farming. He gives us a good general definition: ". . . part-time farming involves the combination of farm and off-farm uses of labor resources controlled by one household or decision making unit." This is much more inclusive than the census definition and would include many units now classed as commercial and as residential farms. But such a definition is necessary to fully cover the use of labor resources represented by farm families.

Bishop points out an important conditioning factor that affects many part-time farmers. The employer usually demands the commitment of a specified minimum quantity of labor. Currently this is usually 40 hours per week. An additional point that should be brought out in this connection is that the total time devoted to productive labor by the part-time farmer may be substantially more than that of many full-time farmers. This raises problems of participation in community affairs. Does the farmer and his family have any time or energy remaining after meeting the demands of the farm and the other job?

This also raises the question of what scale and type of farming should the part-time farmer carry on. Different families resolve the question in different ways. Some gravitate toward a size of farm business that will allow for mechanization and fairly efficient commercial production. Some gravitate toward limited production for home use. Decisions as to scale are conditioned by motivation, energy, managerial ability, family labor supply, availability of land and fortuitous circumstances.

Bishop also points out some of the limitations of part-time farming in respect to area development. So far, the growth of part-time farming has been associated primarily with the industrialization of agricultural areas where owner-operated farms predominated. In high tenancy areas and under the cropper system of multiple-unit farms the landlord sees a conflict of interest in allowing the tenant or cropper to hold another job. The same tendency has been observed under corn belt conditions in Ohio. Therefore, the labor supply tends to move either into industry or to remain entirely in agriculture. But this tendency is a relative not an absolute force.

Although part-time farming is not a cure-all for the low-income farm problem, it does definitely play an important role. Its development has been stimulated by numerous factors: employment opportunity, the short work week in industry, high industrial wage rates relative to farm earnings, good roads, cheap automotive transportation. These and other factors motivate people to farm part-time in both poor and good land areas. Most part-time farmers contacted in an Ohio study are satisfied with their choice. In their opinion they are maximizing the use of their resources.

This Ohio study, now in progress, points up one phase of part-time farming

worthy of mention. About half the farm operators spending 100 days or more in nonfarm employment also have a size of farm business that would class them as commercial farmers according to the census definition. One implication of this is that the development of part-time farming in a low-income farm area need not necessarily establish a pattern of very small farms of the subsistence type. If the land resources are adaptable to a family-type commercial farm a substantial share of the part-time farmers may use their off-farm earnings to develop such units.

Some other things apply to the present context. Many people desire rural living for reasons other than income. People will travel 15 to 25 miles to work by choice in order to live in a favored location. They will travel up to 50 miles or more if necessary. In these days of good roads distance by most is measured in time not miles. The average part-time farmer spends very little more time traveling to work than the average city dweller. Employment-wise, the urban-industrial fringe in an area with good roads has a radius of 25 to 50 miles.

I would agree with Bishop that introduction of nonfarm employment into a farm community does not necessarily provide a solution for the low incomes of farm families. Marginal industries *may* exploit labor; so does low-income farming. On the other hand, a community may pass through various stages of industrial development. In that respect is agriculture and industry so different? Should not every community take stock of its resources, its advantages and disadvantages for both agriculture and other industries?

So long as agriculture is a low-wage industry and so long as farm families produce a surplus population, we can expect some farmers to seek more profitable employment. Some will migrate, some will farm part-time, some will continue to live in the country as residents only.

Both Bachman's and Bishop's papers point out complexities of the low-income farm problem on which we as social scientists need to be better informed.

DISCUSSION: THE LOW-INCOME FARM PROBLEM

CHARLES P. LOOMIS
Michigan State University

Our chairman has asked me in the few minutes that remain to summarize the papers presented, particularly those dealing with the social and cultural aspects of low-incomes among rural families.

Obviously, too little time remains to present an adequate summary of these very excellent papers. I am sure that all of you in recent years have sat through many conferences on underdeveloped and distant areas of the world where the discussion and papers presented were far less enlightening and helpful than these papers we have heard today, which deal with our own underdeveloped areas.

There are considerably more than one million farm families in the United States with annual incomes of less than $1,000. These farm families are, for the most part, in what may be called "cultural islands." The cultural islands such as the Spanish-Americans of the southwest constitute social systems with values that differ some from the main society and the families living there are not abnormal in the sense that they have more than their share of crippled.

named and mentally defective persons. The low-income families of the nation have relatively high birth rates, a characteristic that holds for most low-income farm groups in various parts of the world.

In the United States the low-income families not only have high birth rates they also have very high replacement rates. They produce more than their share of the manpower that goes into agriculture and urban industry. As would be expected the low-income families have relatively low levels of living both in terms of material facilities and such services as schooling and health. The various papers have been unanimous in the stress they place upon considering the problem in all of these ramifications rather than any separate facet. Monistic interpretations and single-approach solutions are condemned. Improved education alone, will not solve the problem, neither will more available credit alone; introduction of improved agricultural practices, alone; better transportation, alone; new industries, alone.

In closing, I should like to agree with this basic approach, however. It is time that we learn enough about low-income conditions in the underdeveloped areas of the United States and the rest of the world that we can begin to talk with some assurance about priorities. If we cannot do everything at once and with the same emphasis, what should we start with? And what should receive major emphases at various stages of a program?

I am reminded of the anthropologist, Ralph Beals' statement in what he calls a frivolous note, to the effect that as he sees the acculturative forces at work in Central America one road is worth three schools and fifty administrators. Can we not begin to call the priorities? Unfortunately the papers are silent on this matter, and unfortunately, I fear, we do not at present have the knowledge necessary to assign priorities to all the varying situations. We need more research and accurate records on attempts to solve the problems of underdeveloped areas.

THE ECONOMICS OF FORAGE PRODUCTION AND UTILIZATION

Chairman: John C. Redman, University of Kentucky

PROBLEMS OF RESEARCH IN THE ECONOMICS OF FORAGE PRODUCTION AND UTILIZATION

Russell O. Olson
Agricultural Research Service

A FIELD of study as broad as "The Economics of Forage Production and Utilization" takes in a good deal of territory. A discussion of the problems encountered in doing research in this area could amount to a complete account of the problems faced in farm management research. The difficulties one runs into in research on forage economics are typical of the difficulties found in work on most problem areas in farm management.

Although the various types of difficulties are viewed in terms of research on forage economics, they apply as well to many other farm management research problems. I shall discuss three categories of difficulties, (1) conceptual difficulties, the problems that arise in deciding what kinds of information are relevant to the analysis, (2) empirical difficulties, the problems of obtaining the appropriate technical data, and (3) evaluation difficulties, those of selecting the appropriate choice criteria.

Conceptual Problems

The amount of difficulty experienced in forage economics research is dependent upon the completeness of the model mapping the analyses. On most corn belt farms the structure of the decisions regarding the production and utilization of forage is complex. Choices include the quantity and kind of forage to produce, the selection of technical processes of production, harvesting, storage and feeding techniques, and the quantities of forage to be fed to the different kinds of livestock. The best decision in each instance hinges on the decision reached in each other instance and also on numerous other factors that are peculiar to each farmer's situation, such as the labor and capital available to him, the nature of his time preference, his disposition toward risk bearing and other personal preferences.

The limitations of our research tools make it impossible for us to take into account all relationships that bear on optimum decisions in production and utilization of forage. Of necessity, we simplify the problem by restricting our inquiry to those variables and relationships that seem to us to be most relevant and are amenable to observation and measurement.

We make convenient assumptions about the remaining variables. Often we must be arbitrary in deciding how far to go in this process of simplifying the problem. In general, we expect that the further we go toward simplifying the model, the more it will depart from the structure of the real situation, and the less useful will be the analysis in guiding farmers' decisions.

Here is a fairly typical situation on Corn Belt farms: Some pasture is produced on land unsuited because of terrain and soils for production of other types of crops. In addition, forage is produced on land suited for cultivated crops as part of a crop rotation. Forage crops compete with other crops for the use of such land. On many farms, labor and capital are limited and forage crops compete with other enterprises for their use. Typically, the farms are organized for feeding a large part of the forage and grain they produce to one or more classes of livestock.

When forage is produced as part of a rotation, the quantity of forage that should be produced can be decided only if we know the resource requirements for forage and for each of the other crops in the rotation, the relative values of the products, and the nature of the transformation rates between forage and the other crops. Certain simplifying assumptions can greatly reduce the difficulty of arriving at *a* solution. For example, if we assume that forage is perfectly competitive with other crops in the use of resources, the per acre costs and returns of forage crops and other crops can be determined independently. When a single year is under consideration, this may be a realistic assumption. If all resources except land are unlimited, the optimum plan requires that all of the acreage be devoted either to forage or to the other crops, whichever returns the largest net income per acre. An optimum plan that involves forage as well as other crops might result only if the supply of resources other than land were limited.

To assume that forage crops are perfectly competitive with other crops in a rotation is unrealistic when, as is usually the case, a farmer's planning horizon extends over several years. The amount of forage in the rotation generally affects the economy of production of other crops, and net returns from forage and other crops cannot be determined independently. The technical information needed to find the optimum acreage of forage must include the relation of production and yields of forage to production and yields of other crops in the rotation in *each* of the several years included in the farmer's plans.

Finding the value of the output of forage is simple if certain assumptions are made. We may assume, for example, that market prices of forage and of grain measure the relative values. When forage crops are bought or sold the market price, with a premium for the cost of bringing the forage

to the farm or a discount for the cost of moving it to market, may be a valid measure of the value of forage. Typically, however, forage is produced to feed livestock on the farm on which it is produced. The appropriate measure of value is the value as a livestock feed. A convenient measure of the value of a unit of forage fed to livestock is in terms of the value of the quantity of grain that would have an equivalent feeding value. The evaluation problem would still be simple if forage and alternative feeds were perfect substitutes in livestock nutrition and could be substituted at the same rate for all classes of livestock. Assumptions of this kind are implied when comparisons are made on the basis of such common denominators as total digestible nutrients or net energy values. But, as most livestock men know, the feeding value of forage relative to other feeds depends on the proportion of each in the ration and on the kind of livestock to which it is fed. For a farmer who feeds his forage to livestock on his farm, the value of the forage and the quantity to produce in competition with other crops can not be determined independently of the livestock program.

An analytical model directing research to information appropriate for decisions as to optimum production of forage on typical grain-livestock farms will be structured in such a way (1) that increasing marginal rates of transformation between forage and other crops in a rotation are allowed for, (2) that diminishing marginal rates of substitution between forage and other feeds in livestock feeding can be determined, and (3) that the optimum feeding of forage is determined jointly with the optimum production of forage.

Empirical Problems

The theoretical conception of the problem outlines the kinds of information needed. The empirical job of obtaining this information involves further difficulty. Most of this information is technical and the subject matter of fields other than economics. These technical data might logically be considered as part of the "given data" to the agricultural economist.

Agricultural economists, however, have not been satisfied with this division of labor. They have found the experimental data inappropriate for economic analysis. They have at least three common criticisms: (1) The data are based on controlled experiments where the conditions for production and the levels of management involved are so unusual that inferences to any real farm situations are not possible. (2) The form in which the results are reported makes economic interpretation difficult. (3) Results are frequently reported only for single points on a production surface, or for averages of several such points.

Dissatisfaction with the kind of data provided by other agricultural sciences can turn us in either one of two directions. (1) We can set out to obtain our own estimates of these technical relationships from farm surveys or accounts. (2) By establishing better communication we can consult with the technical scientists about the kinds of relationships and statistical measures that are most relevant to economic analysis.

In developing our own estimates of the technical relationships from farm surveys, we may select our samples so that we can obtain observations from farms with managerial inputs and other conditions representative of large groups of farmers. Any advantage this may have over the controlled-experiment method is lost, however, when we consider the difficulty of obtaining meaningful estimates from such surveys, even aside from errors in observation. On the forage-production phase of the problem, it is difficult to insure homogeneity of the quality of land, weather, or the quality of the forage over the wide geographical area usually required in a farm survey. Differences in managerial inputs among farms in the sample cannot be measured with our present techniques, or adequately be taken into account. The difficulties we meet in trying to estimate production functions in the feed utilization or livestock-feeding phase are perhaps even more difficult. In a farm survey animals ordinarily cannot be selected on the basis of production qualities. Although it is possible to subsample on the basis of rates of production, there is no satisfactory way of learning the extent to which rate of production is the result of the inherent ability of the animal, the level of management, or the input of feeds and other resources. Thus, under normal conditions, observations obtained from farm surveys are not observations on a single production surface. Particularly in the instance of feed-utilization studies, criteria are usually lacking for classifying the observations into their separate production functions.

We may be more successful if we leave the estimation of the technical coefficients to agronomists, engineers, and animal nutritionists, who by training are better qualified for that type of research. However, they must then take our needs into account in designing their research. That is, their research needs an orientation that will make their estimates appropriate for economic analysis. This is perhaps one of our chief responsibilities—to give direction to the work of our colleagues in these other disciplines. This may be pardonable immodesty.

Economics is an administrative science concerned with how scarce resources can be used more efficiently, in light of available technical knowledge, in satisfying ends of the decision making unit. Other agricultural scientists also are (or should be) concerned with the more efficient use of scarce resources. But the historical development of specialization in

agricultural research has placed agriculture economics as a field of research in a position parallel to agronomy, animal husbandry and agricultural engineering. Because of their insulation from economists these scientists have often selected physical criteria of efficiency (maximum yields per acre, maximum daily rate of gain, etc.). Counsel of the production economist is needed as much as that of the statistician in the design and interpretation of much of the crop and livestock research. The fact that we so seldom cooperate in such studies suggests the need for discarding habits and customs that make each department in an experiment station almost a self-sufficient unit. Initiative is required to open up new channels of communication that foster joint economic-technical scientific research.

Although we have been slow in developing effective working relationships with other agricultural scientists, progress has been made in recent years. The Jensen-Woodward study of input-output relationships in milk production,[1] published more than ten years ago, was a remarkable achievement for that period. Even today it is one of the most useful sources of information on dairy feeding. It illustrates the complementary effects of allowing economic and physiological concepts to come together in the design of a biological experiment.

The hog feeding experiment by Heady, Woodworth and Catron[2] is an example of a more recent study in which biological research was inspired and guided by economic logic. The recent study by Heady, Pesek and Brown, which deals with fertilizer-crop response surfaces,[3] is an additional illustration of agronomic research taking its direction from economic theory. Other similar studies in progress in various states are benefiting from the joint application of the economic and biological theories.

The pioneer work done by a few individuals may soon have gone far enough to stimulate a reappraisal of the production economist's role in agricultural research. The day may not be far off when agronomists and economists will work together in designing forage production studies, and livestock nutritionists will use our counsel as they do that of the statistician in developing ration studies. Looking toward that day, we may well ponder upon the difficulties such a situation will bring.

An apparent difficulty stems from the fact that economic theory does not specify the choice of the functional forms that should be applied to

[1] Einar Jensen, T. E. Woodward, *et al., Input-Output Relationships in Milk Production,* U. S. Dept. Agr. Tech. Bul. 815, 1942.

[2] Heady, Woodworth and Catron, *New Procedure in Estimating Feed Substitution Rates and Economic Efficiency in Pork Production,* Iowa Agr. Exp. Sta. Res. Bul. 409.

[3] Heady, Pesek and Brown, *Crop Response Surfaces and Economic Optima in Fertilizer Use,* Iowa Agr. Exp. Sta. Res. Bul. 424, 1955.

data in describing technical relationships. As agriculturalists we may expect diminishing marginal rates of transformation of fertilizer into forage. As economists we cannot specify that this relationship is best described by the Spillman type curve [$Y = M(1 - R^x)$], the Cobb-Douglas type function ($Y = aX^b$), or a second degree polynomial ($Y = a + bX + cX^2$). The algebraic form the relationship takes follows agronomic, not economic, laws. Our responsibility is one of specifying the *kinds* of technical relationships that are needed for economic analysis. The agronomist's job is to choose the mathematical forms that will best describe these relationships.

In studies of the economics of forage utilization, the problem is to select the best combination of forages with other feeds when the choices often include an infinite number of combinations of feeds of several different kinds and qualities. The optimum combination depends upon the rates at which these various feeds substitute for each other. There is nothing in economics that says feeds substitute at diminishing rates; but whether they do or not, in fact, affects the choice of the optimum ration. The economist's responsibility in dealing with this kind of problem is not to specify the algebraic form of the function describing the substitution relationship, but to make explicit the *need* for describing the relationship.

One could dwell at length on the difficulties met by the physical scientist in carrying out studies aimed at estimating technical coefficients relevant to forage economics problems. But once the experiments are designed these difficulties are largely the worry of the physical scientists. Some of these difficulties may be mentioned here because they affect the confidence we can attach to results of many of these experiments. The difficulties experienced are largely difficulties of measurement and control. In the first place, pasture yields are difficult to measure. Ingenious techniques have been developed to measure production in terms of quantity consumed by livestock, output of livestock product resulting from grazing, pounds of hay equivalent, and so on, but these measures do not give consistent results. A second difficulty arises from the lack of objective measures of the *quality* of forage. Estimation of substitution rates among feeds requires that the quality of each feed be identified, especially if the quality of a feed is related to its rate of transformation into livestock products. An additional difficulty in carrying out forage utilization experiments is that of selecting homogeneous animals for the experiment. If a single animal is used and the effects of variation in the ration fed are measured to obtain an estimate of the production surface, considerable time will be involved, carryover effects from one feeding treatment to the next may be difficult to measure and age of the animal and external factors such as weather will affect each treatment differently. Probably it is more practi-

cable to attempt to select a large number of homogeneous animals and to give each a different ration treatment. In that way each animal will provide an observation on a different point on a production surface. A real difficulty exists in assuring that the animals selected for a study are actually alike in the way they respond to feeding treatments. Although animal scientists have developed techniques that make refinement in selection of homogeneous animals possible (use of identical twins, and so on) practical limitations of the number of animals available for the project may force a compromise in selecting the animals.

Evaluation Problems

We cannot unload all the headaches in research on forage economics on the physical scientists. Solutions to farmers' problems in production and utilization of forage require that we place values on inputs and products. It is no simple matter to do so. Lowell Hardin's paper is enlightening on the matter of values to place on forage produced. At least it sets useful maximum and minimum values, based on cost of acquisition and disposal value, that can be determined easily. Between these boundaries the value of forage depends on its marginal value productivity in livestock feeding. Thus, on farms where forage is produced and fed on the farm, the value of the forage depends on the kind and amount of livestock on the farm and the feeding system followed.

Costs enter into decisions on optimum plans for production and utilization of forage. Costs are not simply determined by applying current prices to resource requirements. Some of the costs involved are joint costs for several years' production. Many investments made in previous periods give us fixed assets in the current period. We have difficulty imputing the proper costs to such assets in comparing alternatives. Often the relevant costs are the opportunity costs. If we have given technical coefficients we can translate these into costs only if we know a great deal about the details of the situation in which they are applied. Relevant costs in selecting the combination of livestock depends upon the buildings and equipment already on the farm, their adaptability for various kinds of livestock, or their salvage value if not used. Relevant costs depend, too, on the discount rates a farmer applies to compensate for uncertainty and for time preference.

In effect, given the relevant technical information the solution can be worked out only when applied to a specific set of circumstances. We can make applications to groups of farmers in similar circumstances if we can make valid generalizations about farmers' behavior. Here is a fertile area for research by economists (or should it be psychologists). Length of tenure, capital reserve, size of family, the stage of the farm in the

family cycle,[4] and other factors affect rates at which farmers discount future costs and returns, the adjustments they make for risk, and so on. The proper way to take these considerations into account in computing costs and returns remains a major difficulty of research on forage economics.

[4] See Heady, Back, and Peterson, *Interdependence between the Farm Business and the Farm Household with Implications on Economic Efficiency*, Iowa Agr. Expt. Sta., Bul. 398.

ECONOMIC APPLICATION OF FORAGE PRODUCTION AND UTILIZATION RESEARCH

IRVING F. FELLOWS
University of Connecticut

ECONOMICS is a science of administration. This knowledge area is one that can be used to give logical content to human action in the use of scarce resources. With the objectives given by the administrative unit and by using the assumption of rationality, interpersonal conclusions can be reached on resource use when appropriate technical and price information is available. Here is the key to the economic application of forage production and utilization research. Efficient and consistent action relative to the resources involved in forage production and use cannot be taken without adequate technical data. The administrative unit cannot maximize objectives consistently without extensive response data. These data are the results of formal and informal research.

Probably there is little disagreement with this broad framework. But problems arise when one becomes more specific about what is the administrative unit, what resources are involved, what is adequacy in response information, and how is application made. These are some of the questions we wish to explore.

What is the administrative unit?

Within the institutions of our nation, there are three types of administrative units to apply the results of research in forage production and use, firms, governmental agencies and farms. In the former group we will find a few corporations operated for profit. Government agencies are bodies authorized to carry out legal actions for organized groups. The latter category will include the vast number of individual operators of family farms. This is the agent most often using response data in forage production and use. We must recognize this agent and understand his needs and desires if efficient application of the forage information is to be made.

The most important characteristic of this agent and his situation is that each case is unique. We do not need to dwell on the reasons for this uniqueness. Variations in the individual operator, the quantity and kind of resources under his control, the farm family, the kinds and sequences of family objectives are broad categories, each of which includes literally thousands of important variations. The possible combinations based upon these variations are so great that no two individual situations are exactly alike.

Another characteristic concerns the sovereignty of this agent. The farm

operator, or better still the farm family, is solely responsible for resource allocation within certain institutional restrictions. They are the only ones capable of determining and evaluating the ends or objectives in their case. The family farm operates in a complex situation in which the interests of the firm and household are so closely entwined that profit maximization is not a meaningful objective in itself. In a broad sense, the objectives have been well described as "life, liberty, and the pursuit of happiness." The exemplification of these goals can take many forms.

With specific objectives in mind, however, the agent does determine *what* resources to use, *how much* of each resource to use, and *when* to use each resource. With these decisions, the farm business and farm family living take form and costs and returns result.

Another characteristic concerns the evolutionary situation in which the agent finds himself. He is part of an everchanging, ever-evolving environment. Changes in the relevant technical information and price data are easily recognized. But often overlooked are the changes in the social and institutional environment having a direct bearing on the administrative responsibility. In other words, changes in all the variables do condition decisions by the administrative agent—some through the channel of production functions and prices and some through alteration and development of family objectives as time and events unfold.

These characteristics place important limitations on the kinds and forms of information that should be made available for application by the agent. Recognition of these limitations is an important step in the conduct of research and in the presentation of research results. In recent years, such recognition has been lacking in many of the studies in farm management and production economics. Many researchers were more interested in demonstrating over and over again that they possess skill in applying mathematics and statistics within the framework of well established and widely accepted economic models provided for us by economic theorists. If results were presented only once in this light, one could accept the material as the flowering of youthful enthusiasm. But when the presentations appear as problem solutions for administrative agents without recognition of the uniqueness, the sovereignty, and the evolutionary state of the agent, this information becomes grossly misleading.

One might argue that the information was for the benefit of another administrative unit—the governmental agent. It is desirable to provide concepts that will enlighten those responsible for action through this agent. But let us be sure that we have a broad conceptual model for our framework. Political, sociological and other knowledge areas will have a contribution along with the economic model. To the extent that action is dictated by the governmental unit, decisions by other administrative

units are minimized and, except for recognition of the limitation, are not part of his management problem. To the extent that action is only encouraged by the governmental agency, decision and action revert once more to the individual operator and recognition of his characteritsics become strategic to action.

What resources are involved?

Application of research on forage production and use calls for the identification of the resources involved. This is a double problem. (1) The administrative agent must identify the variables in the problem he faces. (2) He must identify the variables in any research data obtained in the hope of being useful to the solution of his problem.

Identification goes farther than mere recognition. Variables must be classified as to those that can and those that cannot be controlled in a given time period; and the relationship between controllable independent and dependent variables must be described as to form and the probabilities attached.

To visualize these problems, researchers in production economics have used the generalized functional form, $Y = f(x_1, x_2, / x_3, \ldots, x_n)$ to connote some relationships among dependent and independent variables, some of which are recognized as variable and others as fixed in the time period. As a particular problem becomes delimited, a more specific functional form takes shape such as, $Y_{corn} = f(V, S/L, F, E, x_6 \ldots x_m) + u$. The experimental evidence permits estimates of the form of relationship among Y_c and V and S and the parameters of the function.

Here are data that the farm manager can use. Knowledge in the form of a particular relationship between the crop and the independent variables has been made available for his application. This is not true. These data are useful for predictive purposes only under certain conditions. The relationship of the dependent variable was conditioned by all the other variables in the function. Those variables that are fixed play an equally important role in the problem. Use of the relationship for predictive purposes is limited to situations that duplicate the fixed variable. If these conditions are not met, application of the information is highly questionable.

In addition the "u" term in the equation is of strategic importance. This term partly reflects a relationship to many unspecified and uncontrolled variables. To the extent that these relationships can be considered as randomly and independently distributed with respect to the controlled variables, statistical procedures can cope with the problem. There is great doubt that this condition is obtained in many experiments in forage production and use. Almost certainly it does not apply to the use of the ex-

perimental information for predictive purposes in a unique case.

On the grounds of the above discussion, there is grave doubt about the applicability of forage research information by the individual farm operator. In following the usual pattern outlined above many production economists have not only cut off the fixed variables by drawing a vertical line, but also they often cut off their appreciation and comprehension of the problems involved. Excessive concern with techniques of estimation has dulled the philosophy and logic necessary to bring assistance to the administrative agent in his use of research information.

Admittedly a compromise is necessary between wide coverage and accuracy in experimental activity. Recently, perhaps, the emphasis has been too great on accuracy and high levels of confidence in our estimates. In discussion at the recent Symposium on Methodological Procedures in the Economic Analysis of Fertilizer Use Data at Knoxville, Mr. Hildreth conveyed a similar conclusion. His belief was that overemphasis on accuracy within experiments involving only a few controllable variables had severely limited the usefulness of the data for predictive purposes. He recommended that accuracy be sacrificed to obtain relationships among more variables with greater replication both in space and in time.

The mere addition of variables will not solve a more basic problem however. Inferences must be drawn from one sample (the experiment) to another sample (the problem situation facing the operator). The validity of this action is determined by an appraisal by the farm operator of many resources—variable and fixed, controllable and uncontrollable. This appraisal is one of the duties of the manager. Payment to the managerial function is for this appraisal process and for the responsibility borne for action taken in the light of the appraisal. If the form of the relationship among variables and the probability distribution is known with certainty, there would be no need for the management function. To aid in the appraisal, however, research data in forage production and use should present an extensive discussion of the particular resources and their characteristics in the particular study sample.

What is adequacy in response data?

This question is really a part of the previous one. It was separated to give special emphasis to a problem that is faced when attempting to apply research information in forage problems.

The question is not concerned with adequacy from a statistical standpoint although this could be an intriguing phase. Rather it deals with the observed response data and how well they fit the needs of the administrative agent. We wish to turn to the "Y side" of our functional equation.

Problems in the identification, measurement and evaluation of output in forage research have been discussed by the previous speakers. Response in the usual sense of crop and livestock yields has many ramifications and latent influences that should be measured as outputs. These evaluations are difficult to make. However, they are only transitory outputs as far as the farm operator is concerned. The farm family is concerned with specific objectives. Intermediary outputs such as crop and livestock yields are inadequate for the wise use of resources to achieve given ends. The impact of resource use is evaluated by the administrative agent through its effect on the composite returns—not on a particular return. Alternative adjustments in resource use and the coincident change in costs are evaluated in terms of related adjustments in all outputs and the coincident change in all returns. A decision on the use of the relevant resources can then be made that will most nearly achieve the objectives given by the agent. For example, forage production research showing the response of ladino clover to specified levels of potash and superphosphate under specified soil and management conditions can be applied by the farm operator only when he can also trace the associated effects upon livestock response and the use of equipment, buildings, land, and labor; when he can attach costs and returns in monetary and non-monetary terms; and when he can compare the net results for several alternatives. In addition, some evaluation of the risks and uncertainties of the alternative plans will permit a choice by the agent in line with his value system.

How is application made?

The discussion to this point has attempted to expose some of the problems arising in the economic application of forage research data. With the present question some constructive comments can be made. With or without agricultural economists, forage will be grown and will be used, and in these processes research data will be applied. The only question facing the agricultural economist is this: Can our knowledge area contribute to economic efficiency in application of these research data to the actual production process? Of course, the answer is a firm "yes" if we will act as economists and not as petty dictators, if we will be teachers of concepts and methods and not be advocates of production practices.

As production economists we are neither tool makers nor, basically, tool users. The tool user is the administrative agent, generally the individual farm family. This agent has already been characterized as unique, sovereign, and evolving. In an attempt to maximize a flow of returns with the resources subject to his control, the agent performs a continual process of decision making.

Decision making is a complicated process described briefly (1) as awareness of a problem, (2) as collection and appraisal of information relevant to the problem, (3) as decision or solution of the problem, and (4) as action in line with the solution. As teachers, we can be of assistance to the agent in the first three steps through the use of our science.

Awareness of a Problem

The motivation of the human agent is an interdisciplinary question. Certainly awareness of a problem is closely associated with the basic drives of the family. There must be a discontent with goal accomplishment or with the goals themselves, and with this discontent there must be a belief that a change will improve the situation. Education in all its ramifications serves both to stimulate discontent and belief in improvement. It is here that the production economist can be of service to the agent. Exposure to new ideas in the organization and operation of the farm is possible through the many communication devices. My belief is that most of the activities of past and present day production economists in agriculture assist the agent at this step. Record keeping and analysis; studies on production costs, enterprises, and practices; reports on case farms and farm adjustments all serve to expose the operator to new ideas and awaken interest. Studies, now popular with production economists, that attempt to measure marginal rates of substitution or transformation in the factor-product complex, or the marginal elasticities of production, or apply the techniques of activity analyses all merely serve to stimulate interest once they have been interpreted for the agent.

All of these activities are useful in stimulating the interest of the agent, but all are useless in specifying action in resource usage by the administrative agent. From a management standpoint, general recommendations are misleading and erroneous whether they are simple average relationships or are derived with many mathematical manipulations. To use the information for purposes other than interest stimulation is to be misleading to the agent. The production economist who believes he is solving production problems by these methods is continuing the errors of the past. He is merely committing the same errors with greater precision than before.

Collection and Appraisal of Information

Once interest has been aroused, collection and appraisal of relevant information is the next step on which production economists can assist the administrative agent. This agent is acting with incomplete information. At best, he has only an approximate knowledge of present costs, a rough

estimate of future prices, and sketchy estimates of production responses associated with particular input combinations. These price and response estimates come from many sources—from his experience and the experiences of his neighbors, from general informational sources, and from technical agricultural agencies. This knowledge is composed of truths, part-truths and inaccuracies. It confounds the influence of many variables and provides spotty coverage of the practical range of inputs. Yet, with this knowledge, the farm operator determines the production pattern. That the pattern fails to maximize the established goals is almost inevitable.

The production economist can help to improve this situation. In the development of research information, he should work with groups of technical scientists to expose the types of questions that are faced in an allocative problem, to indicate the kinds of conceptual relationships that may exist, and to suggest the range in coverage and the confidence levels that are useful for decisions. Once this is done the experimental design and analytical procedure can be worked out in conjunction with statistical technicians to provide unconfounded estimates of relationships and probability distributions. As price information is an equally important phase of the allocative problem, research on price generation, relationships and expectations should follow a similar procedure. In this instance, the production economist might work with other economists or carry out the experiment himself.

In the communication of information, the production economist should catalog the research material by intensive identification of inputs and outputs and their relationships. Results should then be presented through many communication media with special emphasis on case studies and demonstration farm units.

From these presentations, the agent must draw conclusions. But at all times, the formal and informal research information must be reviewed critically by the agent as to its relevance to his situation before inferences are drawn and predictions are made.

Decision or Solution of the Problem

Finally, the production economist can be of major assistance to the farm operator when the actual decision or solution of the problem is made. Our science can furnish the logical framework that will assist the agent in the decision process. A major task of the farm management worker should be to teach these concepts and stimulate their use. The task should not be too difficult if we will recognize the characteristics and limitations of the persons to be taught and if we will present the principles in simple usable terms. To be perfectly honest, there are not many principles to teach. For the competitive equilibrium model (a reasonably appropriate

one in our work) there are but five main concepts—three to cover the marginality—factor-product complex, and two resulting from the introduction of limited resources and uncertainty.

The limited number of principles far outstrips the usable technical and price data that are available now or in the forseeable future. Because of this and because the agent cannot make the necessary simultaneous solutions if several variables and interactions exist, two concepts will suffice for most decisions, (1) the budgeting of changes in costs and returns, and (2) the extensive comparison of budgets or of opportunity cost. In our experience, these concepts can be grasped quickly and easily by practically all farm operators. In fact they are the methods now being used by the farm families who appear to be successful in achieving their objectives. There are no other concepts that meet the test of simplicity and adequacy.

The numerous books, bulletins and papers that have recently presented basic economic principles in actual problem settings are useful for the edification of fellow workers in the field. But, often the emphasis on mechanics has disguised their real purpose, the demonstration of a logical framework to assist in problem solution. These continued demonstrations hardly seem necessary, for the student of economics can obtain the principles in concise form in several texts that have been available for nearly twenty years. Continual demonstration misleads the student in the belief that he has become a specialist in production economics if he can apply a few elementary economic models or speak knowingly about functions. The mechanical side of the principles is unnecessary to the real purpose of models. For example, in his task as a teacher of concepts, it is better for the production economist to know the limits and general characteristics of the factor-product complex than to have "knowledge" of the production surface in an extremely simplified substitution problem. This is the case where a little "information" in a specific area is much more dangerous than none. This situation applies to information on forage production and use as in all technical and price data.

Summary

In discussing the economic application of forage production and utilization research, the following points have been stressed.

(1) Economic application refers to an allocative act within a means-end situation.

(2) The agent carrying out the act generally is the farm family. This agent is unique, sovereign, and evolving.

(3) Under this situation, the production economist working in agriculture must refrain from prescription in resource use and become a teacher. As such he will assist the agent directly in three ways:

(a) By stimulating his imagination to inspire him to see problems and to change.
(b) By encouraging the agent to use his mental powers to help solve problems through the collection and appraisal of relevant information.
(c) By providing the agent with a useful conceptual method with which economic efficiency can be achieved in allocative problems.

The production economist will assist the agent indirectly in four ways:

(a) By interpreting the allocative problem to the biological scientists so that the technical information from research may become more amenable to use on this problem.
(b) By working with fellow economists to study price generation and relationships.
(c) By working with other social scientists to improve our understanding of the human being and motivation of the human agent.
(d) By working with technicians in communications to become more efficient in the transfer of knowledge.

There is sufficient scope in this outline to challenge the most ambitious agricultural economist, to free him from the yoke of recommendation in resource use, and to raise him to the position of a teacher.

ECONOMICS OF FORAGE EVALUATION[1]

LOWELL S. HARDIN
Purdue University
AND
GLENN L. JOHNSON
Michigan State University

INVESTMENTS in forage stands yield joint products, (1) feed and (2) fertility factors. A storage stand, unlike an annual crop, is a semidurable asset. This stand is capable of yielding its joint products annually over a period of years.

Although it is acquired at some cost, the stand may have almost a zero sale value. Earnings through use may be substantial. Because of high handling and transportation costs plus imperfections in the market, considerable spread exists between the individual farmer's purchase and sale prices for pasture or hay.

These considerations make accurate forage evaluation difficult. Correct pasture evaluation concepts are needed, however, (1) to price forage as an input as in feeding trials with animals, to decide on feed combinations, or to do farm management cost of production work, (2) to price forage outputs as in agronomic experiments, and (3) to be an aid in deciding what acreage of forage to produce on a particular farm when other crops such as corn might be produced.

In a perfect market, price of forage feed would tend to equal its marginal value product (MVP) which would be equal in all feed uses. The MVP (use value) of feed forage on a given farm is what it is worth at the margin in producing livestock and livestock products. The MVP of the fertility contribution of forage may be similarly defined in terms of its worth at the margin in crop production.

Evidence exists to support the hypothesis that the MVP of forage as a feed and as a fertilizer declines as more forage is used and as additional uses are adopted within a given farm organization. Use value on a particular farm, therefore, depends upon that farm's organization in a particular period. This use value may be greater than the acquisition price, less than the disposal price, or somewhere in between.

If cost of production or acquisition price *equaled* disposal price *equaled*

---

[1] This is an abstract of a more complete study of the subject made by the North Central Farm Management Research Subcommittee on Pasture Evaluation. This work is published as North Central Regional Publication No. 48, *Economics of Forage Evaluation*, by Glenn L. Johnson and Lowell S. Hardin, Purdue Agricultural Experiment Station Bulletin 623, April 1955, and is available from the cooperating states in the region.

marginal value productivity, forage assets or forage could be evaluated from estimates of any one of the three. Actually the three figures usually differ. Thus a frame of reference is needed for interpreting and using the estimates.

Frame of Reference

A suggested frame of reference is presented graphically in Figure 1. This figure applies to a given farm as organized at a given time. The MVP line in the figure represents successive additions to the gross income of the farm business that result from using successive additional quantities of the asset being evaluated.

Acquisition cost is the marginal factor cost if the asset is purchased, or

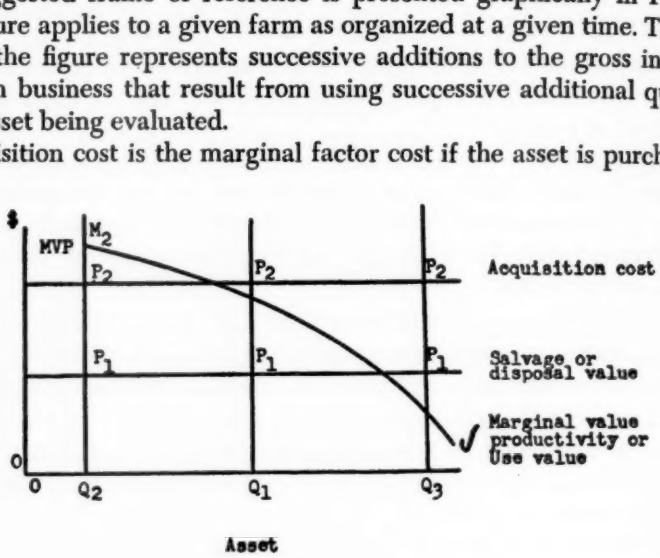


FIGURE 1

the marginal cost of producing more of the asset if it is produced on the farm.

Salvage or disposal value is what could be realized from one unit of the asset now on hand, if the asset were to be disposed of either within or outside the business.

If, as in Figure 1, a farmer has Q_1 of an asset on hand, that quantity has an MVP of Q_1 M_1. This is greater than salvage value (Q_1 P_1) and less than acquisition cost (Q_1 P_2) of another unit. Since there would be no reason to acquire more, or to dispose of part of the asset, it is fixed. Its value, under these conditions, is its use value (MVP).

Further examination of the framework suggests that the appropriate value for forage assets is:

1. Not *less* than the highest net value realizable by disposal–salvage value.

2. Not *more* than the cost of acquiring, by the most economical means available, additional forage units or their equivalent–acquisition cost.

3. The value through use—MVP— if this falls between the limits of 1 and 2 above.

Situations exist in which each of the above values is appropriate. The framework holds for one-use assets (as pasture) where the forage acreage is fixed and for durable assets (as forage stands) where forage acreage is variable. In the latter case, discounting procedures are required to handle durable assets and MVP becomes discounted MVP (the present value of the stream of MVP's that the asset is capable of producing during its lifetime).

To go a step further, crop rotation theory, with forage as one of two inputs or two outputs, may be extended (1) to cover the existence of two prices (acquisition and salvage), and (2) to cover the possibility that the asset could be purchased and/or farm produced.

Empirical Estimates

Robbins'[2] data were used in an attempt to employ the framework outlined to estimate feed and fertility values of one acre of mixed alfalfa forage from which was harvested 2250 pounds of total digestible nutrients. The estimates are presented for purposes of illustration rather than as meaningful values.

As a feed input, $8 per acre was the highest net value computed for off-farm disposal ($17.50 rental income less $9.50 for market value of N, P, K carried away from farm by grazed animals). The most economical per acre acquisition cost computed was $21.50 ($17.50 rental cost plus $4 inconvenience charge). Estimated MVP for the feed forage with typical use in area was $13 to $15.

Estimates of fertility contributions were added to the above feed values. This brought the total value of the crop output (feed plus fertility) to not more than $41.50 (acquisition), or to less than $28 (disposal). The MVP for the total crop output was not computed, but may have approximated $35.

The empirical treatment is sketchy, even for illustrative purposes. Much remains to be done empirically. This rests on the development of more comprehensive sets of production relationships.

---

[2] P. R. Robbins, "An Economic Evaluation of Pasture in Central Indiana," Ph.D. Thesis, Purdue University, 1953.

DISCUSSION: PROBLEMS OF RESEARCH IN THE ECONOMICS OF FORAGE PRODUCTION AND UTILIZATION

S. A. ENGENE
University of Minnesota

The paper by Russell Olson reviews the current situation; it does not outline startling new ideas. It is a good job of the prosaic task of evaluating where we are in order that we will be able to do a better job of determining where we want to go. Mr. Olson has done a good job of highlighting important issues in a very big problem.

As he says, the problems of forage are about as big as the problems of farm management because changes in forage affect nearly all phases of the farm business. He vividly describes the conceptual difficulties. We might add these two statements. First, the problem is so complex that an adequate model is too big to be used effectively in any single study. That leaves the dilemma of deciding to do a superficial job on the entire problem or a fairly thorough job on a part. Second, we are trying to describe a twelve-cylinder problem with a two-cylinder theory. With the present stage of development of our theory we find it difficult to analyze a problem with more than two variables. Our forage problem involves many variables. Part of our job is to expand and improve the theory.

Mr. Olson states that we commonly simplify the problem by considering only those variables that seem most relevant and are amenable to observation and measurement. At least a part of this "simplification process" is due to the inadequacy of our economic theory. In his closing statement he says that a major difficulty in forage economics research is that of properly taking into account the manner in which length of tenure, capital reserve, size of family, the stage of the farm in the family cycle, etc., influence the discount of future costs, returns, and risk. In essence this is a description of an area in which we find our economic theory lacking.

In his second section he repeats the usual economist's plea for technical data adapted to our needs. Such data are needed, and needed badly. All of us can lend support to the plea. With this plea, however, must go a recognition of a responsibility. If we induce an agronomist or other research worker to design his experiments according to our recommendations, we must be sure that the results will be more useful than they would be otherwise. Is our knowledge of production economics sufficiently well developed so that many of us can give good advice or effectively use good experimental data if they were available? The technical information developed from past experimental work may not be to an economist's liking, but we must admit that it has led to outstanding achievements. We should be sure that we can improve upon it before we criticize or tamper too much.

Fortunately, a few experiments are being designed in cooperation with economists. If these are developed carefully, they can be very valuable. Possibly or even probably the most important results will be improvements in our theory or in understanding of production economics rather than in changes on the technical side. At least, we as economists must keep that objective clearly in view.

DISCUSSION: ECONOMIC APPLICATION OF FORAGE PRODUCTION AND UTILIZATION RESEARCH

B. D. CROSSMON
University of Massachusetts

Dr. Fellows has developed an extremely thought-provoking paper. Initially, the title "Economic Application of Forage Production and Utilization Research" led me to expect the paper to deal with a difficult problem; namely, how forage research results can be applied to particular farms Always an enthusiast of the case method of teaching, I anticipated some empirical examples to illustrate how forage research findings could be transferred to farms. The paper presents an interesting development of theory. Its empirical support is lacking. Before touching on some Northeast forage research, I would like to comment on the broad framework of theory Dr. Fellows has expounded.

First of all, I find myself almost in full agreement with the paper. Even at the start, I do not disagree with what is said. My concern is with the way the author says it. The head of steam the author had at the start left me several readings behind. A repetition of the four introductory sentences of the paper may illustrate my point:

> Economics is a science of administration. This knowledge area is one that can be used to give logical content to human action in the use of scarce resources. With the objectives given by the administrative unit and by using the assumption of rationality, interpersonal conclusions can be reached on resource use when appropriate technical and price information is available. Here is the key to the economic application of forage production and utilization research.

In a way this is like initial steam from a boiling kettle; it's there but can't be seen. I tried the paragraph and paper out on one of my associates. "A nightmare of polysyllabic verbalism," he said. Why do professionals supposed to be teachers seek to use complex words, many with multiple meanings, of which a particular meaning is clear to the writer? For example, Dr. Fellows defines economics as a science of administration and he goes on to talk about administrative units.

Administration and administer are words of broad and varied meaning. To administer may mean to dispense justice or to apply a remedy. The settlement of an estate often is done by an administrator. To manage or direct is probably the meaning Dr. Fellows had in mind. Would not management or management unit have a more familiar-sounding ring to economists and farmers?

The paper says there are three types of administrative units (management units to me): namely, firms, government agencies and farms which will apply results of forage research. Whether three is the maximum number of our institutions utilizing forage research probably does not matter. The arbitrary distinction Fellows makes between firms and farms interests me. Firms utilizing forage research results operate for profit only, he says. Might not firms as well as farms have motives other than profit, e.g. public recognition or esteem in the eyes of others? And do farms operating for profit revert into Fellows' firm category?

In the paper governmental agencies are quickly dismissed as appliers of forage research. They "simply carry out legal actions for organized groups." This is clear even if it is an oversimplification of governmental agency func-

tions. Is Dr. Fellows thinking only about such action agencies as SCS and PMA? What about farms operated by governmental units? Do they use forage research results any differently than other farms? What about the many of us who are government workers? How well does the above definition fit our work? Perhaps we are suppliers not appliers of forage research.

The principal applier of forage research and the one to whom we should devote most of our attention, and again I agree with Dr. Fellows, is the farm unit. I wonder why the commonly known farm operator or manager is veiled as the "agent of an administrative unit." Dr. Fellows says "this agent is unique," has sovereignty and operates in an ever-changing world. Acceptance of these characteristics depends to some extent on the chosen meaning of "agent." If a common definition of an agent is a person acting for others, then the characteristic of sovereignty is less certain. Some farmers are sovereign in their farm units. Many others, however, are overruled by the whims of their families, their landlords or their creditors.

The paper does an excellent job in discussing the question of resources and associated variables involved in farm production problems. The danger in drawing inferences from one sample (the experiment) to another sample (a farm problem) is cited. To the extent that the farm unit problem is unique, the word sample no longer seems appropriate. The paradox of controlled experiments with a few controlled variables carried out with great scientific precision having little application is well described.

Our Northeast Farm Management Research Committee benefited from meeting with the leader of such an experiment[1] a year or more ago. This was a dairy feeding experiment and the results had been popularized in the Northeastern farm press. Dairymen were told that the most profitable rate of feeding concentrates was at the rate of one pound of grain to six pounds of milk. Of 60 Holstein cows, selected on the basis of similar characteristics, three groups of ten cows each were compared on the basis of no grain fed, and of approximate ratios of 1:6 and 1:3. Cows were fed all the U. S. No. 1 alfalfa they would eat with the given concentrate feeding. The results appear as three points on a production surface, the middle one (1:6) being most profitable at prices prevailing at the time of the experiment. The adequacy of these limited points to indicate profitability even for these particular cows is questionable. The applicability of the data to Northeastern dairy farms in general is dependent on the representativeness of the experiment to prevailing dairy farm characteristics. Typical Northeastern dairymen do not have a bountiful supply of U. S. No. 1 alfalfa and probably have little idea of the capacity of their cows. The believed capacity level of the cows in the experiment was 9,000 pounds of milk which is well above Northeastern averages per cow. Diminishing marginal returns were encountered in the experiment with heavier grain feeding. Shouldn't this be expected when response was about 1,000 pounds per cow above expected capacity? This gives no indication that the heavier rates of concentrate feeding would not pay on more typical Northeastern dairy farms.

Another fallacious application of forage research data appeared in a proposed New England brochure this year. A key statement read: "On the average, $18 worth of fertilizer will grow enough additional herbage to give 4,000 pounds of milk." A check on the indirect source led to two station bulletins

[1] New Jersey Agricultural Experiment Station Bulletin 758.

each describing response for five years of sustained fertilization of the same grass paddocks.[2] The brochure statement is clearly related to a generalization in the first bulletin: "The production of a typical neglected upland native pasture in Maine is about 700 pounds of 4 percent milk equivalent per acre, as indicated by Paddock 8, Highmoor Farm, whereas adjacent liberally fertilized paddocks produce well over 4,000 pounds of 4 percent equivalents per acre." Bulletin 488 reports on the continuation of the experiment for five more years. The unfertilized paddock showed an upward trend in yield during the ten-year period. Not only does this increase in yield without fertilization seem phenomenal but it disproves the generalization in the first bulletin. The ten-year average yield of 1,053 pounds of 4 percent milk per acre is not a representative measure of yield developments. On the average over the ten-year period no fertilized paddock exceeded Paddock 8 in growing enough additional herbage to give 4,000 (more) pounds of milk. Average yields for the paddocks were poor indicators of yield response. Under sustained fertilization, yields tended to increase for five to seven years, then they declined. A few of the fertilized paddocks did exceed unfertilized Paddock 8 by more than 4,000 pounds of milk yield during two of their peak years. On previously unfertilized pasture, response to sustained fertilization was excellent for a few years. When diminishing absolute returns to fertilizer appeared, the undetermined importance of other variables is suggested. These two cases of faulty application of forage research data have been presented to give support to Dr. Fellows' careful outlining of the problems involved. In the two cases cited discovery by economists of the fallacious application of research material was not in time to prevent its release to farmers. Certainly production economists have a responsibility of working closely with other production scientists in research and teaching. In his last sentence, Dr. Fellows has hinted at ranking the teaching above the research.

I give hearty endorsement to the conclusions of the paper. Here the role of the production economist and that of the farm family unit are clearly distinguished. The former is challenged to become a better teacher in problem-solving methods. The latter is to be motivated to use knowledge and method in making decisions on resource use. Before closing I would like to pay tribute to the quality and applicability of some of the forage research published by Dr. Fellows in the Northeast. He has modestly refrained from mentioning examples of his work or his current leadership of a Northeast regional project. Another example of excellent research using the representative case farm approach in studying forage adjustments on New England dairy farms is soon to be published as a book by the Harvard University Press. Dr. Richard G. Wheeler, one of our current hosts, is the principal author.

[2] Maine Agricultural Experiment Station Bulletins 415 and 488.

DISCUSSION: ECONOMICS OF FORAGE EVALUATION

CARL P. HEISIG
Production Economics Research Branch, ARS

As a research administrator, I have not had the time nor the opportunity to keep abreast of all the new developments in method and theory that have occurred in the field of economics of forage utilization during the past few years, but I am impressed with the breadth of interest and the competent attention that is being given to the problem.

How to utilize effectively and profitably increasing quantities of forage is an extremely important question today and it will be for some time in the future. This question frequently is at the heart of developing improved conservation farming systems. It gets involved in arguments as to how best to utilize acreages diverted from surplus crops, and how best to move toward a better adjusted agriculture from the standpoint of prospective available markets.

The matter of valuing forage production is only one facet of this general problem; but it is an important one in research analysis and in helping farmers to understand better and to do a more effective job in developing profitable livestock systems of farming.

Messrs. Johnson and Hardin have made a distinct contribution to developing a better understanding of the underlying problem and a better set of analytical tools for evaluating forage production. Mr. Hardin is to be complimented for informally presenting the basic elements of their analytical framework in a simple, easily understood manner. This makes for more complete understanding of the essential ideas by those in attendance without the confusing complications and qualifications of the details of the more complete treatment.

I can only be complimentary in my comments on the analysis that has gone into the development of this frame of reference for evaluating forage production. As indicated, the problem is an extremely complicated and difficult one, as evidenced by the fact that an adequate framework has not been developed before. The central idea of establishing the upper limit as the value of the acquisition costs and the lower limit as the disposal value provides a useful framework for determining rather quickly the general outside limits within which the answer shall lie. This idea is simple enough, but obviously even these outside limits are frequently difficult to determine for a product that has no readily determinable market value for a specific situation.

I was glad to see that the frame of reference was established within a concept of the farm as a production unit and that value of forage is determined to the farmer by the entire complex of relationships of organization of the cropping and livestock programs. Because of the nature of forage, its use value to the farmer depends on how well he fits his forage program into the other parts of his farming program. Although the frame of reference developed does not provide specific guidance on how to determine what this use value is, it does, it seems to me, narrow the problem and focus the researcher's attention on the significant aspects of the problem to consider.

I would have liked to have seen more attention given to the specific problem of how one determines the marginal value product both in the short-run and the long-run situations, but that perhaps was beyond the scope of this particular assignment.

I would guess that most of the problems of valuation would be concerned with more precise location of the MVP rather than with the upper or lower value limits as indicated by the acquisition cost or the disposal value. And in this effort it is soon apparent, as Mr. Hardin has indicated, that much research of an empirical nature remains to be done on the development of more exact and more comprehensive sets of production relationships. We have not even developed, for instance, a very satisfactory method of measuring the amount of forage produced from pastures. The development of such kinds of information will be needed to make the framework of reference really useful in servicing research workers and farmers.

WHAT IS THE FOOD INDUSTRY DOING TO STIMULATE THE DEMAND FOR FOOD?

Chairman: J. Russell Ives, American Meat Institute

ECONOMIC ASPECTS OF FOOD ADVERTISING AND PROMOTION

HERRELL DEGRAFF
Cornell University

PERUSAL of the literature indicates that this topic has not been intensively pursued by agricultural economists. A few specialized studies have been made in specialized settings. But the working hypotheses developed seem to be quite inconclusive. Thus in the absence of a developed body of fact and interpretation it is quite likely that almost any two of us would approach this topic differently. Each would treat it from his own background, with the limitations of his own understanding, and would develop the topic, of course, in terms of his own working philosophies. I approach the task with a highly developed appreciation of salesmanship. I was a salesman long before I was a teacher. Moreover, my experience as a salesman was concentrated in the 1930's when selling was not mere ordertaking. For this reason I have, perhaps, more than a usual appreciation of the function of aggressive salesmanship.

Let me begin with the elementary concept that consumption is the endpoint of production. As fundamental as that point is, I am not sure—judging from some of the wartime farm legislation under which we still are operating—that it is fully appreciated by all citizens and legislators. What is produced must be sold, with a reasonable exchange of value for value in the marketplace, or the production is economically futile.

It has been said, and I think rightly, that salesmanship has been a dominant factor in the evolution of our economic society. As consumers we have been sold automobiles, television, elaborate plumbing and heating, and endless other goods and services developed by a category of people whom we can call The Dissatisfied. They have envisioned comforts and conveniences not previously available. The offspring of their intellects have been sold to the rest of us for satisfaction of wants we had not previously known. In fact, an expanding economic society with rising productivity per capita and rising levels of living goes forward not on producing increasing per capita supplies of traditional things. Rather it is characterized by the development and production of new goods and services designed to satisfy newly created wants. This is what underlies the declining relative importance of agriculture in an increasingly industrialized society.

Pertinent to this point is the useful distinction between level of living and standard of living. Level of living designates that pattern of consumption that a society actually has attained. Standard of living by contrast is a pattern of consumption to which people aspire. In a static society these two are much the same—whereas a more progressive society with rising levels of production per capita is probably characterized by a standard of living that ever outruns the existing level of living. Perhaps this is, in fact, the fundamental character of an aggressive materialistic society.

In such a society salesmanship rises to eminence. The farther any society advances beyond subsistence, the greater is their aggregate capacity (1) to divert productive resources to new products and services, and (2) to indulge frivolous whims in consumption. Surely, viewed against a puritanical conscience, a considerable part of our present level of living is pure frivolity—and our individual standards of living contain even more of the same. That this is true is a tribute to salesmanship. Salesmanship is a dominant factor in demand creation. More than most people know, and far more than most would acknowledge, we are molded by salesmanship. A majority pride themselves on their cynicism and their capacity to sort out and discount self-serving appeals to their attention and their pocketbooks. Yet we all fall for whomever piques our curiosity, stimulates our imagination, and ends by creating a want where no want existed.

I do not mean that I consider fellow citizens to be economically irrational, any more than I would accept that I am. Rather, the point is that human wants are insatiable, not for the essentials of life, but completely so for the frivolities. Moreover, the great majority of wants are highly subject to influence through the substitutibility of one satisfaction for another. In a market where the capacity for alternative spending is greatly limited—that is, where all capacity to spend already is absorbed in the unavoidables of living—little gain is to be expected from aggressive selling behind any product. Even the opportunities for substitution are small. Quite the opposite is true where the capacity for alternative spending is large.

In our economic evolution the essentials of living have required progressively less of our productive efforts. More frivolous things have proliferated. They are produced in enormous quantity and infinite variety because we who are public buy them. We buy them because we have been sold. Economically speaking the capacity to produce is less critical than the ability to sell. We have some evidence that this is now true in American agriculture, and normally it is true for most lines of business. Thus salesmanship becomes a primary economic function.

Advertising, and its essential corollary, sales promotion, are a part of selling. They are salesmen's tools. Their purpose is to tell first what is available, what are its characteristics and values, and why the prospective purchaser would find satisfaction in the product. Secondly, and this differentiates sales promotion from advertising, they are all those activities, usually carried on somewhat closer to the prospective purchaser, that follow up the advertizing and convert a mere interest into an actual sale. They have become notably useful sales tools in a market as large and diverse as that with which we have to deal. A producer seeking broad distribution has an immense market to reach. He presents his story first where prospective customers may see it—and then concentrates his promotional follow-ups wherever the more likely purchasers are expected to be concentrated. To reach a mass market, he uses mass selling media. The individual salesman—that is, the producer's person-to-person representative—is not displaced. Rather, his job is simplified by mass forms of appealing to customers. Thus advertizing and promotion are successful only when used in a sequence that follows through from interest-getting to more serious consideration to a completed sale. They are tools to selling, but only tools. They are useful because the market is so wide and diverse that primary personal contact is otherwise difficult to establish. They work because, unlike the economic models of earlier theorists, the market is composed of consumers whose knowledge is not perfect and whose demands are highly subject to influence.

In this setting, aggressive selling may function so well as actually to affect the demand schedule of the public—in other words, to shift the demand curve to the right. Perhaps a lesser but equally sought goal is to increase the elasticity of demand for the product, resulting in greater sales response whenever a price concession is granted. Through changing the characteristics of demand it becomes possible that competition among alternative forms of spending need not concentrate solely on price, but can (and in practice does in considerable part) center on service and convenience, on emotional appeals, on propaganda sometimes of doubtful taste and validity, on highly ethical educational efforts with consumers as to product quality and the benefits they will derive, or on any combination of such factors. Advertising uses all these techniques, because each one, in one situation or another, has successfully boosted sales. All will continue to be used because in the extremely competitive market that surrounds us no stone can be left unturned by the producer who would successfully appeal for consumers' spending.

No other national group at any time or place in history ever attained the level of purchasing power—and especially, the capacity for alternative spending that now rests with the American public. But among sellers

the competition for this spending is equally great. It is the kind of market in which the producer who tells his sales story most effectively, and follows most aggressively clear through to the customer, is the one who gets the business. It is pointless to argue that the public is gullible and easily seduced into spending their mony for a lesser total of satisfactions than they might get. Desires are individual, and in our market are acquired more than inherent. Both the desires and the satisfactions stem from selling.

I do not think that food selling is essentially different from other products. Food is, of course, more necessary—far less frivolous in the aggregate and less luxurious than many other consumption goods. But this is much more true for the aggregate than for individual foods. In our diverse diet the potential for substitutibility, and therefore for aggressive selling, is indeed large. On this point the interests and opportunities of producers and processors of individual foods may differ widely from the interests and opportunities of all producers and processors. Competitive opportunities among different foods, and more specifically among individual firms, are not hampered by this characteristic of food in the aggregate.

Secondly, compared with other potentials, the food market is considered to be much more limited in size—to what can be accommodated in the collective stomach of the nation. Thus the marginal utility of successive increments of food drops abruptly. But again, this is true of all foods much more than of specific kinds of foods—and again ignores substitutibility. An argument might be advanced at this point that this characteristic of the food market is so fundamental as to make aggressive selling self-defeating for all farmers and all food handlers. What one might gain, others would lose. An answer is that different persons looking at the problem have different motivations. Competing firms clearly would have different objectives than would disinterested economists.

A corollary to the low marginal utility of food is its low elasticity of demand. But again elasticities among foods are highly variable—and I believe an assumption that these elasticities cannot be influenced is quite untenable. This is, however, the key question to this whole discussion.

An analysis of the food market over recent years indicates that the food industry has done an excellent job in the competitive drive for consumers' spending. Before the war, food purchases absorbed 23 per cent of per capita disposable income. The same per capita quantity and kinds of food could now be bought for 17 per cent of disposable income. But the American people obviously are not now satisfied with the prewar diet. They are spending for food 25 per cent rather than 17 per cent of their income-after-taxes. In other words, of present per capita food expenditures, two-thirds are going for the equivalent of the prewar diet and

one-third for increased amounts of the more choice foods and additional food services. Changes in our way of living, with emphasis on the many gainfully employed housewives and changed work habits among those not employed outside the home, have stimulated rapid acceptance of new methods of food processing, preservation and preparation. But the increase in commercial services per unit of food does not account for all of our increase in food expenditures. Per capita consumption of red meats in 1954 was 23 per cent higher than prewar, while poultry meat, eggs, and the milk equivalent of all dairy products other than butter were up 87 per cent, 36 per cent, and 16 per cent respectively. A view has been often expressed that in the war and early postwar years when the supplies of many other goods and services were restricted, food was abundant and many families became increasingly attracted to the enjoyment and other benefits of a higher quality diet. Whether or not this is a full explanation or whether comparative price changes, nutrition education, and food industry promotion also deserve credit, it still is true that consumers have continued to purchase a more choice and more nutritive diet even since alternative goods and services have been in abundant supply. The index of per capita food expenditures, based on prewar as 100, has risen even more than the index of per capita disposable income. The two indexes in 1954 stood at 333 for food expenditures and 304 for disposable income. This is the more noteworthy because the index of food prices at retail had risen only to 228. The whole experience seems to be a contradiction of Engel's Law, which states that as family income rises a decreasing proportion of that income is spent for food, and which to my knowledge had not previously been challenged in 100 years. The evidence strongly suggests that an aggressive effort by food processors and handlers to develop food processing and food services that consumers have found attractive, together with efficiencies in production and handling that have made food abundant and low priced compared with consumer incomes, largely explain the expanded demand for an upgraded diet.

Yet in spite of how well the food industry has done, the results are not quite good enough to achieve an equilibrium with the abundance of our food production. We have accumulated our surpluses because production of several major farm commodities has exceeded market demands at legislatively pegged prices. Can these, or comparable per capita quantities, be sold on any basis except through further price concessions that would come largely out of producers?

One point seems certain. We cannot expect to sell more total pounds of food per capita however aggressively we try. For nearly half a century the per capita disappearance of all foods in our market has varied only in a narrow range from an annual figure of approximately 1,550 pounds.

And this figure seems more likely to decline a bit than to increase. This is a pessimistic outlook for any who measure our market opportunity by the physical capacity of the individual stomach. A far more optimistic view derives from the fact that an enlarged market can be found in further shifts in the national average diet comparable with the shifts of the past decade. This of course is the view of the protagonists of an expansion of the livestock fraction in American agriculture and a corresponding shift toward still more livestock products in the diet.

Many persons, some highly placed, have been questioning whether or not we can consume all the food we can produce (or more correctly, all we are geared to produce at cost-price relationships such as recently have prevailed). To fully explore this question would lead us into many side issues concerned with individual crops. Such a review cannot be encompassed in this discussion. But we properly can take note of crops vs. livestock in our present agricultural production and food supply. Currently about 40 per cent of the total pounds of food consumed per person per year are animal products. Also, just about 60 per cent of our money expenditures for food go for meat, poultry, and dairy products. Yet, neither of these figures reflects adequately the importance of livestock in our agricultural economy. Counting mill by-products and the like, we normally feed to livestock a little more than 70 per cent of our total harvested tonnage of crops—and this figure does not include the forage yields from pastures and ranges. This figure shows not only the dominance of livestock in our agriculture, but also how quickly we can accumulate burdensome quantities of crop products whenever normal feeding operations are distorted. Our livestock industry condenses about 7 pounds of dry matter in feed into one pound of dry matter in meat, milk, and eggs.

Much concern is being expressed over our current accumulations of "surplus" feed grains. If, during the next 5 years, these were liquidated down to the levels of carryover stocks of the late 1950's by conversion to livestock products, and if concurrently we were not to accumulate new stocks, the volume of meat, poultry, and eggs would be roughly 2 per cent more per capita per year.

Such an expansion of livestock would pose problems for some farmers. On the other hand strong arguments favor such an expansion. Among them are, first, that this is the only apparent way to get out from under a burdensome excess of accumulations. Second, conversion to livestock products is the only form in which the domestic market can absorb the accumulations (barring war or crop failure). And third, the elasticity of demand is considerably greater for livestock products than for crops.

If the market were to absorb two per cent more meat, poultry, and

eggs per capita per year, what price concession would be necessary if price alone were the stimulus to consumption? Even if we assume comparable levels of purchasing power and unchanged demand, this question is difficult to answer because of lack of dependable information on the elasticity of demand. A clue might be the behavior of beef consumption and price between 1952 and 1953, which was an unusually large change from one year to another. In 1953 per capita beef consumption increased 24.8 per cent at a decline in the average retail price of 22.1 per cent—or a retail elasticity of 1.1.

To avoid a one per cent price decline per unit in order to sell one per cent more, it is clearly necessary to stimulate increased interest and desire among customers for the livestock-product foods. This means stimulating a further substitution of animal products for plant products. It means shifting demand schedules for livestock products to the right. Or if not that, at least stimulating a change in the shape of the demand curves to a position of greater elasticity. Only in this manner can greater per capita quantities be sold without declines in unit prices such as have been experienced in the past. I know of no way that this can be done except through aggressive selling that creates additional relative demand for the animal products. This selling may use a variety of appeals. Health angles, the enjoyment of living, and gracious living are only some. The selling must be done in such a broad and diverse market that personal selling is inadequate to do the job—particularly in these days of highly impersonal marketing. Obviously the mass techniques, using mass media, must be depended upon to reach the mass market. It is a large and complex job—because Mrs. Consumer in the aggregate is not easily moved when price is not the basis of appeal.

But the stakes are large. Our food is a $66 billion retail business. Livestock products, at 58 per cent of the total, account for $38 billion. If a one per cent price concession must be granted to move one per cent more product per person, the shrinkage of retail value on the original volume is $380 million. Some of this money spent for consumer education, for motivation to more healthful and especially to more enjoyable eating, might prove to be highly beneficial to all who produce, process, and handle the animal products. I say "might be" instead of "would be" because I know of no technique by which anyone can measure what selling effort, what advertising appeal, or what promotion method, actually accomplishes a change in sales results. But the competitive bidding for consumers' alternative spending is so intense that I believe agriculture cannot ignore it; and it seems to me unnecessarily fatalistic to gain sales only through price concession. One of the first lessons taught me by the first

sales manager I worked under was that anyone can give things away, but it takes work and imagination to sell. And although the world has changed a great deal since the 1930's I doubt that this fact has changed.

Who should do food advertising? Many producer groups have traditionally taken the view that this is a function primarily of processors and distributors. But these groups are interested primarily in brand selling—and the question for producers is whether or not this is enough. Brand selling very largely assumes the desire for the product, and emphasizes the reasons for the brand instead of the reasons for the product. In essence, a brand is an attempt to create a monopoly situation.

I appreciate brand advertising in foods. I have learned that packer' top brands are placed on meats having characteristics I desire and that certain brands of butter provide what I want in butter. But, of course, I want beef or ham or eggs or butter prior to wanting my specific brand. In food promotion we need something more than brand promotion. In the enormously competitive striving for consumers' alternative spending, not only does one food compete with others, but all food competes with an almost infinite range of other goods and services. In this situation that becomes more pronounced each year we cannot merely assume the demand for the kinds of foods through which the total per capita sales of farm production can be increased. Educational advertising, concentrated strictly on product characteristics and product values, may help to give us the further market expansion we need so badly. Moreover, product promotion of this kind can, and certainly would, serve as a rallying point around which brand advertisers would increase their individual promotions. Product groups who already have undertaken educational programs on the characteristics and merits of their product, have found that brand advertisers welcomed them and tied their brand appeals directly to the educational promotion—thus greatly increasing the sales impact of each educational dollar spent.

Many who advertise, particularly the less experienced, expect prompt results even from small expenditures, and become discouraged if they cannot prove almost at once that the advertising is bringing a big sales response. Such impatience is ill advised if for no other reason than that it is always difficult to isolate exactly what an advertising effort has accomplished. Moreover, it ignores the difficulties always inherent in changing consumer habits. America is hard to move. It takes time, much effort, and considerable expenditure. This is at once a discouragement to those who have a product or an idea to sell, and a fortunate circumstance if the product or the idea is something less than good. But when it comes to food selling we must remember, first, that the drive for consumer capacity for alternative spending gets more competitive each year; and second, that

advertising and sales promotion are selling tools that can and will be used aggressively by others. Hard-headed businessmen would not be using some $8 billion a year in this manner to influence consumer's purchases, if they were not convinced of the results. In fact, advertising and sales promotion are as inevitable in our society as competition. I do not believe their value in stimulating the food market—for individual firms, for individual groups of producers, or for all producers in building demand for those kinds of foods that can be sold in larger per capita quantity—is any different than for other businesses and other products.

THE ECONOMIC NEED FOR ADVERTISING PROGRAMS TO STIMULATE THE DEMAND FOR FOODS

GUY-ROBERT DETLEFSEN
Pillsbury Mills, Inc.

THE approach to this subject could take the form of information concerning what manufacturers do to stimulate food sales. It could outline the vast number of dollars spent in advertising and merchandising and then illustrate it by showing specific campaigns. Such an approach would indicate that there are advertising programs but would not prove their necessity or the whys behind them. Furthermore, it would do nothing to demonstrate their value. At some time in the future, I think an empirical demonstration of their value would be a most valuable piece of research. After thinking over this general problem and rereading my correspondence with Mr. Ives, I decided I really had to speak of the economic need for advertising programs in creating and competitively maintaining the demand for food.

I assume you know food manufacturing associations do much advertising. What I want to show is why this is essential to society, agriculture, industry and the individual firm in our economy of differentiated competition. I choose the term "differentiated" rather than "monopolistic competition" because of the misuse to which Prof. Edward H. Chamberlin's term has been subjected.

As director of commercial research for a large food processing firm, I am often asked the following question:

> Some economists contend that advertising is economic waste, and therefore, isn't management being misled or poorly advised into spending so much money on it?

I want to take this question as my point of departure, because it has implications that cover every aspect of the problem of advertising in an agricultural industry, and because it sums up many widespread misconceptions concerning both the role of advertising and the kind of motivation that lies behind every advertising program.

First of all, as Dr. W. Halder Fisher has suggested, we can break this question down into its major parts, stating it positively, rather than in the form of a question. It then becomes the same as the following syllogism:

1. Some economists state that advertising is an economic waste for society as a whole.
2. Therefore, it must be an economic waste for each individual firm; and,
3. Management is being misled by the "hucksters" of advertising and ill-advised by its commercial research men (such as myself) into spending millions of dollars each year for advertising programs.

I will go into each of these statements separately, but first I would like to anticipate my conclusions by saying that advertising generally cannot be demonstrated to be social waste; and, even if it were, it would not follow that advertising is also a waste for the individual firm.

I

Actually, it is still an open question as to whether advertising is or is not socially wasteful. As I will show, this conclusion by some academic economists is based on postulates that have been carried over, uncritically, I fear, from an earlier stage of society and applied to one quite different from that which gave it significance. Acceptance of this traditional position required the acceptance (either implicitly or explicitly) of a particular set of social goals (value judgments) that we may not be willing to accept. And, finally, a strong case can be made for the contention that these goals would be disastrous for our modern American society, given the institutions and practices that we now recognize as constituting the life-blood of our peculiar form of capitalism.

The strongly humanitarian liberalism that characterized classical and neoclassical economics was formulated before the industrial revolution—that is, before the development of most of our present methods of production and distribution. Technologically, both the industry and the agriculture of that 18th-century day consisted of small scaled operations that employed techniques known for thousands of years to satisfy the demands of an essentially local market. Under such circumstances, it was only natural that early economists took as their fundamental postulates the concepts of (a) static markets, (b) static methods of production, (c) static composition of society's output, and (d) the use of unspecialized productive resources that could be shifted without obvious cost from one industry to another. Within a generation or so, however, our social institutions had undergone such revolutionary changes that those postulates were no longer a valid description of society; yet the elegance and usefulness of the theoretical models that had been built upon them were so great that generation after generation of economists continued to use them—even while recognizing that they no longer bore recognizable resemblance to the realities of everyday life.

As a result of continuously utilizing the classical models when thinking about economic institutions, most of our economists have come to look at advertising against a background that takes as given the existence of static technologies and populations, foreknowledge on the part of sellers as to all possible alternatives of prices and costs, and foreknowledge on the part of sellers and of the government as to the kinds and amounts of consumer demand.

But, in the real world in which you and I operate, technologies and populations are not static, nor are businessmen and the government all-knowing!

New products as well as new differentiations within old products are constantly being developed and must be brought to the attention of consumers. In large part, costs of production (and therefore the prices that must be charged for our products) are functions of scale of output and mass-distribution—even the most expensive items may be brought within the reach of many consumers, if produced and distributed on a large enough scale. All too often, consumers are not aware of their needs and desires until they have been exposed to commodities capable of satisfying their needs. In other words, in our modern society, advertising (or something that will perform the same function) is essential to the maintenance of our particular way of life. Granted that this may not be the most desirable conceivable way of life, but it is the best we know of, and I dare say that few of us would willingly abandon it.

In the static society postulated by economic tradition, certain social goals or values were self-evident, especially when viewed in terms of the democratic libertarianism that we also inherited from the 18th and 19th centuries: basic "creature" needs (food, clothing, shelter, et cetera) should be satisfied before our desires for the less necessary "luxuries"; and known wants (for accustomed goods and services) should be satisfied before diverting resources to the production of "new-fangled" or previously unknown commodities. At the same time, it is "good" for society to achieve and maintain the full employment of all its human and material resources in efficient production. These two broad goals were not inconsistent in the static society envisioned by classical economics and they could be achieved together by maximizing output at the lowest possible total price structure (one allowing no unearned profits to any factor of production). A system of flexible prices that fluctuated in response to changes in the demand-supply complex, coupled with natural human greed (kept within safe bounds by the atomistic organization of production) would make such an outcome the natural aggregative result of our individual economic efforts.

The real situation, however, poses a very different set of problems. Technical advances show us how we can lower costs, increase efficiency, and improve the quality of our products by making capital investments and by producing on a large scale. Most of these investments are labor-saving, at least in the short run. Furthermore, capital cannot be had for such massive and long-lived investments unless there is a high degree of price rigidity that allows them to estimate the expected return to capital over moderately long periods of time. Therefore, unless we constantly

introduce new products and processes or innovations in old product and processes, we cannot have efficiency and full employment of a given labor force at the same time, much less have efficiency and provide work for an expanding labor force. In fact, with rigid prices we cannot maintain the level of consumer incomes without a continued inflow of new products and techniques.

The point I wish to make is that, in the real world, the goals of full output and full employment are contradictory unless we continuously expand our economy through innovation. And we cannot expand our economy without advertising. If advertising is an economic waste, then we must choose between this form of social waste and another—the waste of unused brains and manpower. That is—we must choose between a static and a dynamic economy.

To summarize what I have said up to this point concerning the over-all social significance of advertising: If our society was of the nonprogressive type postulated by traditional economics and had the completely flexible price system that traditional economics assumes to exist, advertising would be a nonproductive and wasteful process *for society taken as a whole*. But with our present economic organization, which is characterized by an expanding labor force and relatively rigid prices, advertising (of the proper sort) is an integral and necessary part of the process of innovation, without which we would have disastrous waste of our human resources.

Your interest, and my individual Pillsbury interest, is primarily directed toward the significance of advertising to agriculture and the processing of agricultural products. Suppose that we examine that same traditional conclusion from the point of view of the producers and the processors of food and fibre raw materials.

If anything, the economic traditionalist would decry the advertising of farm products even more than the advertising of products in general. In addition to the postulates already examined, he would also contend that our demands for foods and fibres are more nearly fixed than for other products; that prices paid to farmers are the most flexible we know and are highly sensitive to changes in both market demand and market supply; and that consumers will tend to be rather insensitive to changes in the prices of necessary or staple products, while highly sensitive to changes in the prices of luxury products. All these things, taken together would convince the traditionalist that advertising could contribute absolutely nothing to the well being of the agricultural community. Implicit here is the further assumption (on the part of the traditional economist) that technological progress in the processing of farm products is even slower than in the nonagricultural industries.

Again in the real world, we find—as you are all aware—that our agricultural industries have several problems that I think make advertising even more essential to their continued prosperity than is the case with other industries. For instance, we have the problem of increasing total consumption in order to dispose of certain embarrassing surpluses. Also there are many nutritionally bad patterns of food consumption (such as the once-prevalent refusal to consume dairy products and seafoods at the same meal) that must be overcome in order both to raise our level of nutrition and to maintain agricultural prosperity. We are now making tremendous forward strides in our methods of processing food products and fibres, particularly in food preservation and the creation of convenience-foods, and these improvements should be used to a much greater extent than they now are. Finally, there is no one best way of preparing our farm products, but rather many different ways, each of which may be best for a large part of the consuming population—so that many differentiations should be presented to consumers. Each one of these problems can be solved but only by some approach that involves advertising among its several elements.

II

We see, if my analysis has been correct this far, that it is improper to consider advertising as being an inevitable waste of our social resources. But even if it were *in the aggregate*, this would not mean that advertising is a waste of the individual firm's resources as well.

The individual firm finds itself in competition, both directly and indirectly, with many other firms. It is in direct competition with all produce goods and services performing the same functions as its own. Sometimes this similarity is so close that the various products may be termed complete substitutes for each other. At other times the similarity is obvious, but there are differences that make one product more satisfactory to particular groups of consumers than any other. Then the degree of substitutability is lower, and we say that product differentiation is a competitive factor in that market. At still other times the degree of substitution is so tenuous that about the only way it can be expressed is by saying that "they both compete for the consumer's dollar"; that is, that only the limitation of purchasing power can cause a consumer to choose between these two kinds of satisfaction. The only way in which a firm, faced with such a variety of competitive forces, can assure its own survival is by first developing characteristics into its products that best serve the need of a sizable group of consumers and then by seeing to it that all such consumers become aware of those characteristics.

Suppose I phrase this in another way. A firm promotes the public in-

terest *and* its own survival whenever it can profitably give consumers more for their money. It can do this either by giving them more for the same price or by charging less for the same thing. The first is accomplished through product improvement and new product development, either of which may bring about changes in techniques of production. The second is usually accomplished through technical improvements in production that lower costs without any alteration in the product. Classical economics traditionally has tended to emphasize the second of these two approaches—while modern American business tends to emphasize the first. Advertising becomes an integral part of any program of product improvement and new product development, because you must make consumers aware of the better qualities that have been built into the product and of the new satisfactions that are now available. Unlike lowered prices, these characteristics often are not obvious at first glance, but must be publicized and called to consumers' attention.

Finally, from the point of view of the individual firm, we must never forget that every firm is continually meeting competition from many directions. During any immediate instant of time, this competition is for a market that is strictly limited. It is therefore vital that each firm does everything within its power legitimately to assure its own profitable survival. Nevertheless, over any longer period of time, the market is free to expand or to contract, and the efforts of the several firms to better themselves individually may well result in unexpected benefits to all. The development of the modern cake mix brands did far more than call consumer attention to the individual brands. They also called consumer attention generally to cake mixes as convenience foods, and the total market expanded faster than any single brand's share. Many *new* mix manufacturers entered that market to satisfy demands that had been created by the intense competitive efforts of a few pioneer brands.

To illustrate this from my own experience, Pillsbury successfully established the cake mix business as we know it today. As a result Pillsbury is a customer for something more than one percent of the eggs produced in the country last year. Of even greater significance is the fact that our market research shows us that more than two-thirds of those eggs would not have been consumed if the cake mix market had not been developed. This is also true of the other products, all agricultural, that go into cake mixes, and eggs are only about three percent of the total component product that go into cake mixes.

The cake mix market started with two products—white and chocolate cake—in 1948. Every year since the market for these two product types has increased. But in addition we have added more than eight other types. Test marketing has shown these could not have succeeded without

advertising. Yet today, in spite of the growth of white and chocolate, these other types account for close to seventy percent of the market.

One may ask: Why, if there is a potential demand for a product, must the individual firm advertise it? Why did Pillsbury Orange Cake Mix, the hottest new grocery item in recent months, sit relatively dormant on grocery shelves before it was advertised. The reason is that to the individual firm, other products, especially *nonfood* products, are competing through advertising for the consumers' dollars.

If you want to convince yourself of this, take a couple of magazines as I did last night and look through them with this in mind. I just happened to have with me the August 6 *Saturday Evening Post* and the July 27 copy of *Life Magazine*. There is relatively more food advertising in *Life* than there is in the *Post* but even here, if you will flip through the pages, you will see that there are about 26 pages of food and 73 pages of nonfood advertising. In looking at this, we are soberly reminded that agricultural producers and processors have strong competitors for the consumers' dollars.

On page 51 you will see an advertisement for Pillsbury Orange Cake Mix. Here is a product not only utilizing all of the agricultural products in regular cakes but developing a new use for oranges. This product could not be introduced and its volume maintained without advertising.

III

I have spoken strongly in favor of advertising from the viewpoint of both society as a whole and the individual firm, but I do not want my remarks to be taken as a blanket endorsement of every form of advertising effort with which we are familiar. There are some kinds of advertising that clearly constitute economic waste for society as a whole; and particular advertising often has proven quite wasteful for the individual firm that undertook it. Suppose we look at this side of the picture for a moment.

There is such a thing as advertising that is bad for society. It consists of all those forms of advertising that are essentially deceptive, claiming virtues the product does not possess. Such advertising as this (and I hasten to add that almost any industry is guilty of it at one time or another) constitutes social waste of resources that could be used to far better advantage in many ways; but the worst we can call it is *waste*. It is not economically harmful.

It is, in essense, the same kind of economic waste that exists in all phases of life. It is true, for example, that oaks are grown from acorns; but think of the quantity of acorns that go to waste. That wastage does not harm the production of oak trees but without a doubt Mother Nature

could be more efficient. This is true of advertising, particularly since the evaluation of advertising is subject to human frailty. Furthermore, it is possible for an individual advertiser to profit from advertising that may be socially wasteful. Generally, however, he is not making the most efficient use of his advertising dollar if advertising is socially wasteful.

Quite often the individual advertiser profits—and well—from advertising that is socially wasteful. Therefore, social waste cannot be taken as a criterion in determining what is good or bad for the firm. Nevertheless, we can make the following positive distinction from the point of view of the individual businessman: any advertising is bad that fails (a) to expand the market while maintaining the firm's market share; or (b) to improve market share in the face of moderate competition from other firms; or (c) to maintain market share in the face of intense competition. The first two of these three purposes may be thought of as being "aggressive" while the last may be termed "defensive." In terms of the best interest of the business, all advertising should be aggressive in intent, and the businessman always hopes that its results—in the form of positive growth in sales—will justify it. But in an intensely competitive market situation, such as characterizes most consumer goods today, advertising that might at another time be called "aggressive" is often thought to justify itself if its results are merely defensive (that is, if it succeeds in preventing others from making inroads upon the firm's market share, or on the size of the market in which the firm competes).

One of the common misconceptions about advertising by the individual firm is the belief that it tends to create demand inelasticity for the product being advertised and the result of this is an increase in prices to consumers. In actual fact in the type of differentiated product economy that characterizes our food business, the greater the advertising expenditures, the greater tends to have been the relative decline in price. This results from the fact that in a differentiated product economy, we experience kinky demand curves and advertising tends to be a builder of market volume rather than a creator of higher prices.

IV

All of my remarks up to this point have been directed at advertising as a general function in our modern business community. That has been necessary because, regardless of the industry, the problems of advertising are essentially the same. Nevertheless, many of my remarks can be directly applied to agriculture; and, in concluding, I wish to specifically summarize these applications.

In spite of the traditionally scornful attitude of many economists toward the social value of advertising, I am convinced, and I hope I have

convinced you, that advertising plays an indispensable role in our modern society, providing one of the means by which innovations and differentiations are made known to consumers and thereafter tested for survival. In a society organized as ours is, this process of innovation and differentiation is essential to the growth of national income and the attainment and maintenance of full employment. Advertising is even more necessary to the individual firm, since the firm's survival ultimately depends on popular approval of the particular innovations or differentiations that it has adopted. This is the general situation. But precisely what can advertising do for the farmers, the orchardists, the livestock producers and the other basic agricultural operators? And what can it do for the firms that process agricultural raw materials?

For both these groups, advertising can supplement and assist research and development in creating new markets, such as those opened up through the introduction of frozen foods, packaged baking mixes, and other similar innovations. Advertising can help maintain old markets, particularly those that may be threatened by the introduction of some new product with related but different characteristics. An excellent case in point is provided by the advertising campaigns directed toward increasing public awareness of the advantages of cotton over synthetic fibres for many uses. It is not unusual for such a campaign actually to expand the market for the older product. The cotton publicity, for instance, taken in conjunction with the increased use of automatic washing and drying equipment in the home, may well have increased the use of cotton in many households. Finally, advertising can assist in the rediscovery and re-expansion of many old markets for products that have tended to be forgotten by consumers and producers in the rush of innovation. This can be illustrated by the new popularity of popcorn, orange juice, lemonade, milk, cakes, walnuts, ready-to-eat cereals (with the advent of presweetened cereals) and many others. We all know of them, but I think because of the huckster nature of some advertising we tend automatically to reject the essential role of advertising.

One way clearly to see the need for advertising is to study our retail food distribution system. For if we look at that system and accept the assumption that we need to stimulate and upgrade the quality of food bought by consumers in order for agricultural products to maintain their competitive position in the economy as a whole, we face a situation that only advertising can meet because of the tremendous increase in self-service selling.

This is particularly true when it comes to new products. The average super market carries today in its grocery department 3,500 different items. How could the shopper be expected to find within this vast number a new

item unless his attention has been called to it through advertising. Obviously, the shopper could find it only if the retailer were willing to give it exceptional display, but then again the retailer will not do this unless he is assured that advertising has already presold the consumer.

Without advertising, the retailer would give new items only a minimum amount of exposure for his display space is too valuable for him to gamble with a new, unproved and unsupported item. He is, of course, not willing to take on himself the risk for promoting it—he is convinced that it is up to the manufacture to accept this risk.

In other words, without advertising a new product would get no support on the trade level. It would therefore get only a minimum of attention from the consumer and consequently it would move at an extremely slow pace. It is questionable how many new products would come on the market under such conditions. The number of items carried in the grocery department of a super market has increased by 1,300 in the last five years. These are the items that have contributed most to the increased value of food consumed and to the food increases in the standard of living. Products like cake mixes would not, in the main, have found a market without advertising.

Conclusion

The attributes of advertising that I have mentioned benefit both the raw material producers and the processing industries. To the former group they contribute the security of continued or expanding demand, and to the latter they contribute an opportunity (often the only opportunity) for survival. There is one further advantage of advertising that is of primary direct importance to the processor of agricultural raw materials, but that ultimately benefits the producer of those materials as well: it makes possible the introduction of new differentiations. Dry breakfast cereals and prepared baking mixes probably illustrate this as well as anything. In both fields, new variants on existing products have been made by many manufacturers, each of which has had the opportunity, largely because of advertising, to build up a following of consumers who prefer that particular differentiation to any other. To the degree that this merely redistributes a constant demand among competing products in a manner that both increases consumer satisfaction and improves the survival probabilities of a larger number of food manufacturers, farmers benefit only through the fact that a greater number of processors are competing for the supply of raw produce. But the presence of a larger number of variants on the same product likely also means that many consumers who had not previously found the product satisfactory will now do so. This will bring about an enlargement of consumer de-

mand for the product and, as a natural consequent, an enlargement of the farm market for the raw materials from which it is manufactured.

I hope that these remarks of mine have contributed to a clarification of the role of advertising in promoting the interests of both agriculture and the processors of agricultural products. I am convinced that the importance of this role has not been appreciated in the past, and that many groups that have actually benefited greatly from advertising by the food processing industries have been among its most vocal critics. This is unfortunate. It stems, in all probability, from the same unrealistic conception of the nature of our economy that has been the main source of academic misunderstanding of advertising. Because of the wide prevalence of this misconception, it is sufficient if I have reminded you that as long as our society conforms to its present structural pattern, advertising will be essential to it. Without advertising, technical progress would be too slow for the maintenance of general prosperity and full employment anywhere in the economy. But more important is the fact that the individual farmer, as well as the individual businessman, benefits by any advertising program that promotes the consumption of any products manufactured from agricultural raw materials.

DISCUSSION: ECONOMIC ASPECTS OF FOOD ADVERTISING AND PROMOTION

E. S. CLIFTON
John Morrell & Co.

The ideas in the paper by Dr. DeGraff are valid and well expressed. I would like to emphasize and expand one or two points, and maybe even disagree mildly with one or two. I find myself in the position of taking some parts of his talk out of context and giving these parts an interpretation perhaps somewhat different from what he intended.

It was an excellent talk. I rate it thus because it started me to thinking (and, believe me, this is no little accomplishment in itself). The things about which it started me to thinking are some of the things with which I will burden you folks now.

First, may I congratulate the program committee for including the subject of food advertising and sales promotion, etc., in this program. This statement is in sympathy with O. V. Wells' plea the other night for theoretical and applied research in this area.

I want to expand the title a little and call his area the field of "demand creation." Dr. DeGraff states categorically in this talk that there is an absence of a developed body of fact and interpretation concerning this area . . . and I'm sure we all concur.

The question that immediately arises is why! This question becomes even more critical when we hear him say that "Economically speaking the capacity

to produce is *less* important than the ability to sell." (This is a key sentence, in my opinion, and one to which I would like to return at a later point.)

One can only hypothesize about the answer to why agricultural economists have failed to work in this fertile area of demand creation. My personal opinion is that for much too long we have taken the position that the consumer is supreme and that marketing research consists of finding out what consumers want, then making the "best use" of our resources, given these ends. The economics of changing the consumers' desires is not considered in the realm of economics. Furthermore, economists or scientists cannot work in the area of demand creation or of changing the tastes of individuals.

I can think of few things less consistent than a group of educators who leave the classroom and a few minutes later loudly proclaim that they cannot indulge in the changing of consumer preferences. How foolish can we get! As educators, we spend our lives molding our youth into patterns of life that we think are desirable for them to have. Oh! We don't call it "demand creation;" we call it "education." It's the painless way (sometimes, at least, it is supposedly painless –what little I got wasn't painless) of changing people. For that matter, so is propaganda. . . . The two of these combined, education and propaganda, are usually the basis of "demand creation." Industry has thrived by creating demand; but it occurs to me that advertising men have done an excellent job of creating demand for their service without any conceivable way of proving their worth. Yet as a profession, we stand idly by and let Dior and other fashion designers lower and raise the hemline, flatten and expand at will, and never seem to get around to investigating the means by which we might turn on the valve to remove surpluses of one kind or another via perhaps similar means. Enough for this point.

I had seriously hoped that Dr. DeGraff might touch on the different kinds of demand curves facing an industry or producer group and an individual processing or distributing firm, and the kinds of advertising that might be most applicable for each. I am perfectly confident that his opinion along these lines would be very valuable.

He states that some producer groups have decided that perhaps distributor and processor advertising might not be sufficient. He discussed the proposition that brand advertising may not be in harmony with producer interests. I wish he had been slightly more specific. I think that brand advertising and industry advertising may conflict and that they are not necessarily complementary.

Industry advertising, particularly in the agricultural field, is usually concerned with increasing the demand for the product and increasing the elasticity of demand. Both of these are often associated with a desire to sell surpluses without sharp price concessions.

Brand advertising, however, is primarily concerned with differentiating the product and decreasing the elasticity of demand for the branded product. Since the total demand must be the sum of the demand for the branded and unbranded product, if the brand advertising is successful, the elasticity of the total demand for the product is decreased. Thus, in this area we see a direct conflict between the two types of advertising. I suspect that different types of advertising might be applicable. Both types of advertising, of course, attempt to increase the total demand function for the product and are complementary in this respect.

I am somewhat reluctant to go along with Dr. DeGraff in giving food and

advertising and promotion a place of prominence in the increased percentage of the consumer dollar spent for food and in the apparent refutal of "Engel's Law." There are too many variables entering into this situation for me to arrive at such a conclusion hastily. Some of the variables are leveling out of income, increased services, support prices for food products, etc. I would like to emphasize particularly the artificial price level and low elasticity of demand for food. A small reduction in production, or in unstored supply if you want to be more precise, would give a large increase in percentage of disposable income that must be spent for food.

Dr. DeGraff pursues the possibility of using livestock to dispose of the feed grain surplus and discusses the possible benefits from "demand creation" instead of price concessions. I do not disagree, but I do not want the impression left that any amount of "demand creation" can necessarily solve the agricultural surplus problem. As Karl Brandt stated in his excellent talk Monday night, we have just entered the phase of intensive, rather than extensive, agriculture. A few rough calculations indicate that the technological efficiency in grain and forage production and livestock production in the last 15 years is increasing more rapidly than population. Should this current trend remain (and I am personally confident that it will), in a century or so, our total consumption of 1,550 pounds of food could all be livestock products and we would still have a surplus. This in no way reduces the importance or validity of the discussion he presented. Also, it does not dispute his contention that consumers have been sold on consuming more expensive and more nutritious foods. Note I say "sold" because tastes are acquired characteristics in general. We start pounding these likes and dislikes into our offspring from the day they are born. Perhaps I should say we "educate" them to like or dislike things.

I would like to return to what I believe is the key sentence of Dr. DeGraff's paper. "Economically speaking the ability to produce is *less* important than the ability to sell." I think this statement should be capitalized and underlined . . . but what a shock it must be to those few remaining advocates who say we must "produce two blades of grass where one grew before because this is the salvation and the solution to all agricultural problems."

It seems to me that economists took a long time to realize that consumption directs production. Otherwise, production is economically futile. The first step in the chain inevitably must be the desire for consumption; "demand creation" if you like. It is from this pinacle of demand creation that consumption patterns are formed and production is directed. Thus, much economic activity generates around the "demand creation" aspect of our economic life. To me, this is the core around which Dr. DeGraff builds his discussion.

Where does this lead us in our economic thought? What types of research and theory are needed to bring the science of economics into proper perspective when considering "demand creation" as an integral and fundamental part of economics? Too long we have closed our eyes and ignored this aspect of our economic life. I believe that Dr. DeGraff does an excellent job in bringing these issues to the forefront. I hope that we as economists do something about these issues.

DISCUSSION: WHAT IS THE FOOD INDUSTRY DOING TO STIMULATE THE DEMAND FOR FOOD?

WALTER B. GARVER
Chamber of Commerce of the U. S.

The subject of this section is billed as: "What Is The Food Industry Doing To Stimulate The Demand For Food?" The title of Professor DeGraff's paper called for a discussion of "Economic Aspects of Food Advertising And Promotion." This I think he has done effectively.

The title of Mr. Detlefsen's paper was billed as "Industry Programs For Stimulating The Demand For Food." I am therefore sorry to see so much of his paper put emphasis on justifying advertising rather than exploring industry techniques and programs to stimulate the demand for food.

I had not felt that in recent years there was any substantial number of economists who seriously contend that advertising is a great social "waste" in our society, or especially that its use is wasteful for the individual firm. I think it is generally true that firms pay out what they do for advertising simply because "it pays to advertise."

I think advertising is misunderstood because we, as economists, put too much emphasis on "waste." I don't want to go philosophical in this discussion, but it seems to me that "waste," as a concept is largely an after-thought.

In retrospect nature itself is wasteful. I have in my back yard a pawlonius tree, which looks like a catalpa but bears nuts much like a chestnut. Every autumn I rake up and burn 12 to 15 bushels of these nuts, yet not in six years has one new pawlonius raised its tender ears.

We have to look at these relationships not as waste, but as "hits and misses." When the sportsman goes after ducks with a shot-gun there would be no waste only if he got a bird with every pellet. Usually he is quite happy if he gets a few hits, and doesn't complain about the misses. In baseball the object is to get some hits—runs—to get on base and eventually "home." It wouldn't be the game it is without strikes, and strike-outs.

In stimulating the demand for food the techniques of advertising and promotion are bound to give us some misses. To count the misses as waste, and therefore the techniques as wasteful, is to miss the whole point of advertising and promotion.

DeGraff and Detlefsen in their papers have done a good job of showing that in our complex society advertising and promotion are not only helpful but the essential circulatory medium carrying the products of mass production in our dynamic and progressing economy to mass markets.

In turning to the demand for food, I have been amazed during the sessions this year to see repeated, time after time, by one economist to another, the old gag about the capacity of the human stomach being limited. I know of no serious student of our demand problems to whom the point is important.

That is not what we are concerned about in our efforts to stimulate the demand for food. We are talking about the total demand, the money demand for food and the propensity to spend that is its basis. What we are after, as Professor DeGraff so well points out, is to shift the total demand curve to the right, and at the least to increase its elasticity, so that specifically increased offerings of food can be sold and consumed with smaller price concessions.

I agree with Professor DeGraff that the main hope of a contribution from shifting the demand curve lies in further condensation or funneling of vegetable products through livestock and animal products. It is largely in this area also, it seems to me, that there is hope of increasing elasticities.

I should like now to take some exception to DeGraff's statement that "an analysis by the food market over recent years indicates that the food industry has done an excellent job in the competitive drive for consumers' spending." Although I do not challenge his statement, it seems to me that his analysis, based on the maintenance of the proportion of income-after-taxes going for food now and in the prewar years, and on the increase in per capita physical consumption of some foods, overlooks the fact that we had a high level of unemployment in the prewar period and have experienced some leveling of income distribution since.

I raise the point mainly because any notion that Engel's Law has been refuted or "repealed" may lead us to an unwarranted complacency about the competitive struggle for the consumer's dollar and to an undervaluation of promotional campaigns to stimulate demand. This could lead to the danger of the food industry permitting food to become only the residual claimant for the consumers' expenditures—a tendency already evident, especially with so large a part of incomes contractually committed or spent in advance.

In a market highly competitive for the consumers' dollars the food economy has first of all a defensive job to do to prevent its falling behind, but the work must be more than defensive. It must be aggressive if the industry, from farm to retail counter, is to progress with the economy.

Professor DeGraff's retail elasticity of beef of 1.1 for 1953 over 1952 is, of course, inordinately high. Rather than this being a clue to the elasticity of meats, I think it is among other things a testimonial to the intensive beef promotional campaign of 1953, a point that in fact underscores his emphasis on demand promotion.

The discussions on this subject have dealt with two types of promotion: "brand name" and "product" promotion. I think there is need also for aggressive promotion of better eating as a valuable attribute of modern improved living. It seems to me that many of us have lost respect for the important function and ceremony of eating and sustaining vitality. We have let the competition of other things and interests cheapen and degrade the arts of preparing and eating food.

Programs to restore the prestige and respect for good food can add new depth and richness to the lives of many of us. Isn't it about time we were learning "to eat better to live better"?

MINUTES OF THE MEETING OF THE EXECUTIVE COMMITTEE OF THE AMERICAN FARM EONOMIC ASSOCIATION, MICHIGAN STATE UNIVERSITY, SUNDAY, JULY 31, 1955

Present: Ackerman, Bottum, Brandt, Cowden, Cochrane, F. Miller, James, Ebling, Nybroten, Witt, Halcrow.

1. The meeting was called to order by President Ackerman.

2. The minutes of the preceding Executive Committee meeting were approved.

3. The Secretary-Treasurer's report was presented and accepted. This report is attached.

4. The report of the Investment Committee was presented and accepted.

5. The report of the Special Finance Committee, prepared by Chairman Franklin L. Parsons, was read. The report was accepted and a vote of sincere appreciation was extended to the donors and to the membership of the committee. The report is attached.

6. Cowden moved that the President appoint a committee to approach appropriate individuals or groups or organizations to obtain funds to support the attendance of graduate students in agricultural economics at the annual meetings of the Association. It was understood that such committee would develop an equitable system of awarding such travel grants if the funds were obtained. Plans developed are to be approved by the officers of the Association prior to activating the program. Carried.

7. Editor Harold Halcrow's report was presented by L. W. Witt. Policy questions raised were referred to the new Executive Committee. The report was accepted and is attached.

8. H. Brooks James presented the report of the Awards Committee. The recommendation of the committee that three $250 awards for outstanding Ph.D. theses and three $250 awards for outstanding research be made was approved.

9. Cochrane moved that the rules in research awards competition be amended by deleting the rule that there be not more than one winner in each research field (classification). It was felt that classification was quite arbitrary at times and that deletion of the rule would simplify classification problems and help insure recognition of the superior papers. Carried.

10. Harold G. Halcrow reported the selection of the Editorial Committee on the best *Journal* article in 1954. The report was approved.

11. Frank Miller reported for the Student Section Committee. The committee recommended that: (1) all student participants in the debate and public speaking activities receive engraved paper weights; (2) that the winning debate team and public speaker receive engraved desk pen sets; (3) that runner-up debate team and public speakers receive one-year subscription to the *Journal of Farm Economics*. This recommendation was approved.

12. Walter H. Ebling reported as chairman of the Agricultural Data Committee.

13. Norman Nybroten reported as chairman of the Employment Committee.

Further policy guidance for this committee was referred to the new Executive Committee.

14. The question of possible new Association committees in two areas was raised by President Ackerman. The areas suggested were: (1) production of volume of readings, perhaps in production economics; (2) suitable recognition of persons rendering long and distinguished service in the field of agricultural economics. These suggestions were referred to the new Executive Committee.

15. The finances of the Association were discussed. In view of the increased financial requirements for: (1) *Journal* publication, and (2) an expanded winter meeting, it was decided that a dues increase of $2.00 per year (for regular members only) would be recommended.

16. The action of the Executive Committee in deciding to hold the annual meeting in California in 1956 was reviewed. It was decided that arrangements should be made for a meeting site two years in advance if possible.

17. The meeting was adjourned.

L. S. HARDIN, *Secretary-Treasurer*

MINUTES OF THE ANNUAL BUSINESS MEETING, WEDNESDAY, AUGUST 3, 1955

President Joseph Ackerman called the meeting to order at 8:30 A.M. and presented his report which is appended.

The Secretary-Treasurer made his report which is appended. Report was approved.

The report of the Investment Committee was given and accepted.

The report of the Auditors was read. A copy is appended.

The report of the Special Finance Committee was read by President Ackerman in the absence of Chairman Frank Parsons. This report is appended.

Walter H. Ebling, Chairman of the Agricultural Data Committee, reported for that committee. It is appended.

Editor Harold Halcrow made his report (attached) which was accepted with thanks.

In the absence of Joe Mutti, Robert Kramer made the report on the Student Section of the Association. This report is attached and was accepted.

Norman Nybroten reported for the Employment Committee as its Chairman. The committee recommended:

"1. That brief resumes of applicants and descriptions of vacancies be put in the regular issue of the *Journal;* both the applications and the vacancies be quoted so as not to reveal agencies or persons involved; applicants pay $2.00 to be listed; vacancies, for legal reasons, listed free of charge; the Executive Committee designate who shall act as the clearinghouse This was recommended as a continuing program.

"2. That the type of services piloted at this annual meeting be repeated next year before these services are voted on by the Association."

The recommendations were referred to the new Executive Committee for action.

On behalf of the Executive Committee Hardin moved that because of the increased cost of publication of the *Journal* and because of expanded winter meeting activities, dues and membership in the Association for regular members only be increased by $2.00 effective in 1956.

A motion by Bishop to amend the motion by discontinuing free distribution of 100 reprints of *Journal* articles was lost.

The original motion carried. This increases the annual dues and membership of the Association to a total of $7.00.

Robert B. Schwart, acting for M. G. Smith as Chairman of the Teller Committee reported the outcome of the election.

M. G. Smith moved that the following statement be transmitted to the President of Michigan State University, to the Dean of the College of Agriculture, to the Head of its Department of Agricultural Economics and to those specifically responsible for arranging for the annual meeting of the American Farm Economic Association.

"The American Farm Economic Association wishes to express to the President of Michigan State University its thanks for the use of its fine facilities for the Association's annual meeting. All members of the Association attending the meeting appreciate the excellent manner in which the staff of the Department of Agricultural Economics of Michigan State University planned and executed arrangements for this

meeting. We wish especially to thank all members of the various committees who have made our stay so enjoyable."

The resolution was accepted unanimously.

Retiring President Ackerman introduced incoming President Karl Brandt and other newly elected officers.

President Elect Brandt expressed thanks for the honor extended, but emphasized his full recognition of the heavy responsibility implied particularly in view of the extraordinarily high standards of duties and performance set by the officers of our association to this day. He invited all to participate in the joint meetings in New York, December 28 to 30, 1955, and encouraged all to look forward to the 1956 annual meetings August 28 to 31 at Asilomar, California. It was further suggested that the 1957 annual meetings would probably be held in the southeastern quarter of the United States.

Harry Trelogan moved a vote of thanks to the retiring officers.

The meeting was adjourned.

REPORT OF THE PRESIDENT

It has been a real pleasure and a distinct honor to serve as your President during the past year. The past year has been an active one, and considerable progress has been made through the splendid cooperation of the individuals serving on various committees and others who have made numerous helpful suggestions. Special recognition should be given to the work of our Secretary-Treasurer, Lowell S. Hardin, and also to the work of Harold G. Halcrow and his Editorial Council. Few of us realize the tremendous amount of time and energy required in these two jobs. Our Secretary-Treasurer has carefully watched expenditures in order to keep the Association in a favorable financial position. The efforts of our Editor and his Council have resulted in the betterment of the *Journal* and the improvement of our professional standing. Separate reports will be given by our Secretary-Treasurer and by our Editor.

In line with the suggestion made at our last meeting we are attempting to strengthen the winter program, and your President-Elect is moving forward with the development of a good winter session. Continued emphasis should also be placed on improvement of the summer program.

H. Brooks James, along with his various subcommittees, has done an excellent job again on the awards program.

Joe Mutti and his committee cooperated closely with the Student Section in trying to strengthen the student program. Suggestions were made that the winner of the debates be awarded a fountain pen desk set with an engraved plaque and that all participants be given some kind of a medallion. It was also decided to attempt, along with the debates, a public speaking contest for which similar awards would be given. There is still some feeling that the student clubs are not functioning quite as effectively as might be desirable.

In accordance with the recommendation made at our last annual meeting, a Committee on Agricultural Data was appointed to consider means of improving the collection, analysis, and reporting of agricultural data, especially those relating to states and subdivisions of states. This committee has met twice, most of the expenses being taken care of individually, but in a few instances by the Farm Foundation. This raises a question regarding the desirability of

the Association's paying the expenses of small working committees appointed to do a particular job.

It seems to me that the time has come for us to consider ways of rendering greater service to our profession and to our members. Since each year the Association tries to show a profit, this would require additional financing. I know of no organization which gives as much for so little, and I would like to suggest that we reduce our reserves, raise our dues, or both.

Some consideration has been given to the appointment of a committee to prepare a volume of readings on production economics similar to those sponsored and published by the Association on agricultural policy and marketing. I think there would be real merit in such a publication.

Consideration might well be given to the appointment of a working committee on research methodology. This is an area in which a professional organization such as ours could make a particularly valuable contribution. Here, too, the results might ultimately be published.

A problem of increasing importance is facilitating the interviewing of candidates for available positions during the annual meeting of the Association. A committee has been appointed to work out a systematic procedure for the interviewing. Norman Nybroten, chairman of this committee, will make some specific recommendations.

The Special Finance Committee has succeeded in raising an additional $2,930 and has suggested that the committee be discontinued until such time as there is further need to obtain funds for the awards program.

I would like to see us develop plans for greater participation by graduate students. It seems to me that financial assistance could be obtained from many organizations to pay the expenses of at least one graduate student from each college to attend the meeting, thus making it possible for him to bring many others with him to the meeting. After discussing the matter with a few individuals I feel sure that through concerted effort such a program could be developed.

I would like to suggest that consideration be given to expansion of the awards program. In recent years the awards program has purposely been directed towards younger agricultural economists. Individuals who have made outstanding contributions to the development and improvement of the field of agricultural economics should also be recognized. These awards need not be monetary; they might well be certificates or fellowships. A committee might be appointed to prepare a proposed plan of recognition.

Let me again tell you how much I enjoyed the honor and the privilege of being your President.

JOSEPH ACKERMAN, *President*

REPORT OF THE SECRETARY-TREASURER

Membership in the American Farm Economic Association continued essentially stable during the past year (Table 1). While the number of regular members of the Association increased to a new high of 1796, numbers of junior members and U. S. firms declined.

The *Journal of Farm Economics* is now mailed to 52 nations outside the United States. Individual memberships include 96 Canadians and 163 foreign persons. In addition, 351 foreign libraries and firms receive our *Journal*.

TABLE 1. NUMBER OF MEMBERS AND SUBSCRIBERS, JULY 1, 1951–1955

	1951	1952	1953	1954	1955	Net Change 1954 to 1955
Regular members	1515	1534	1594	1740	1796	+56
Junior members	149	107	208	187	149	−38
U.S. Libraries and firms	307	321	304	307	269	−38
Foreign libraries and firms	272	317	341	355	351	− 4
Exchanges	12	0	1	1	1	0
Total	2255	2279	2448	2590	2566	−24

Income and Expense

The Association books were audited by a Certified Public Accountant this year for the first time. On his recommendation, a consolidated financial report for the total activities of the Association was prepared (Tables 2 and 3).

Total association expenses exceeded cash receipts by $1,510.66 in 1954-55 (Table 2.) When the activities of the Association exclusive of transactions in the special grants account are summarized, expenses exceeded receipts by $2,481.38 (Table 2A). Expenses exceeded income primarily because the cost of producing the *Journal* increased appreciably with no accompanying rise in revenue. Net cost of producing the *Journal* last year was $16,304, for which members and subscribers paid $12,012.57 in dues and subscriptions. Estimated net cost of producing the *Journal* in 1955-56 is between $18,000 and $20,000.

Balance Sheet

Valuing marketable securities at cost, the net worth the Association total dropped $1,510.66 in 1954-55 (Table 3). If market values are used for stocks and bonds, the net worth of the total Association increased by $10,229.70. If activities of the association exclusive of transactions in the special grants area are considered, net worth dropped $2,471.48 valuing securities at cost (Table 3A).

Five U. S. Savings bonds, series G, which matured during the year were replaced with U. S. Treasury Bonds, 2.5%, 1967-72. Additional savings bonds are now at maturity.

Special Grants Fund

Awards of $1,600 plus $41.75 for certificates and postage were chargeable to the Special Grants Fund this year. If interest and dividends of $257.47 (2½% interest on beginning balance of $10,298.78) are assigned to the fund along with the $2,255 new capital contributions received during the year, the fund shows a balance of $11,169.50 (Table 4).

The work of the Association during the past year, as during previous years, was done by generous individuals and institutions with which these persons are associated. Substantial contributions in time and money were made by incoming and outgoing editors; their Universities, Michigan State and Connecticut; by President Ackerman and the Farm Foundation and by the office of the Secretary-Treasurer and Purdue University.

Respectfully submitted,
LOWELL S. HARDIN, *Secretary-Treasurer*

TABLE 2. AMERICAN FARM ECONOMIC ASSOCIATION STATEMENT OF INCOME AND EXPENSES FOR YEAR ENDED JUNE 30, 1955, WITH COMPARISONS (TOTAL ACTIVITIES OF ASSOCIATION INCLUDING SPECIAL GRANTS)

	Actual 1953–54	Actual 1954–55	Budgeted for 1954–55
Income			
Members' dues	$12,320.71	$12,012.57	$12,500.00
Sale of back issues	1,046.25	454.55	1,100.00
Sale of reprints	812.46	806.05	800.00
Advertising	300.00	300.00	300.00
Graduate Student Section	—	100.00	—
Undergraduate Student Section	20.40	—	—
Awards program	675.00	2,255.00	—
Interest	697.25	737.45	600.00
Dividends	2,223.00	2,699.72	2,400.00
Net balance, Western FEA	—	1.50	—
Net balance, Canadian AES	—	—	—
Sale of membership lists	44.51	15.00	100.00[1]
Total	$18,139.58	$19,381.84	$17,800.00
Expense			
Journal printing	$12,147.22	$15,334.96	$13,600.00
Editing fees	402.50	934.00	800.00
Reprints	1,162.60	1,141.12	1,300.00
Purchase of back issues	50.00	592.00	500.00
Student Chapter charters	—	10.00	—
Awards program expense	1,672.42	1,641.75	—
Annual meeting expense (net)	749.71	381.82	500.00
Postage and telegrams	151.70	335.20	200.00
Office supplies and expenses	422.76	456.64	400.00
Membership lists	—	37.26	—
Subscription refunds	25.18	27.75	200.00
Miscellaneous	—	—	—
Total	$16,784.09	$20,892.50	$17,500.00
Net Gain	+$ 1,355.49	−$ 1,510.66	$ 300.00[2]

[1] Miscellaneous.
[2] To be allocated to Special Grants Fund.

TABLE 2A. INCOME AND EXPENSES, AMERICAN FARM ECONOMIC ASSOCIATION, REGULAR ACTIVITIES EXCLUSIVE OF SPECIAL GRANTS, YEAR ENDING JUNE 30, 1955 WITH COMPARISONS

		Actual 1953–54		Actual 1954–55		Budgeted 1954–55
Income						
Total in Table 2		$18,139.58		$19,381.84		$17,800
Less:						
Contr. to Grad. Sec.			$ 100.00		$ —	
Contr. to Awards Sec.	$675.00		$2,255.00		—	
Interest to Awards Sec.	275.52		257.47		300	
		950.52		2,612.47		300
Adjusted Income		$17,189.06		$16,769.37		$17,500
Expense						
Total in Table 2		$16,784.09		$20,892.50		$17,500
Less:						
Award Prog. Exp.		1,672.42		1,641.75		—
Adjusted expense		$15,111.67		$19,250.75		$17,500
Net Gain		+$ 2,077.39		−$ 2,481.38		—

TABLE 3. AMERICAN FARM ECONOMIC ASSOCIATION BALANCE SHEET—JUNE 30, 1954 AND JUNE 30, 1955 (TOTAL ACTIVITIES OF ASSOCIATION INCLUDING SPECIAL GRANTS)

	June 30, 1954		June 30, 1955	
Assets				
Cash in bank		$ 9,545.10		$ 4,875.41
Investments in U. S. Government obligations				
Series F Savings Bonds at cost plus increment	$ 1,552.00		$ 1,594.00	
Series G Savings Bonds (mature June 30, 1955)	8,500.00		4,000.00	
Treasury Bonds at cost (quoted value June 30, 1955—$22,283)	19,575.53		24,045.54	
		29,627.53		29,689.54
Marketable securities at cost (quoted value June 30, 1955—$59,110)		33,018.60		33,361.65
Prepaid *Journal* publication expense		—		2,803.97
Total		$72,191.23		$70,680.57
Net Worth				
Net worth—				
Balance	6/30/53	$71,052.92	6/30/54	$72,191.23
Gain or loss for year		+ 1,138.31		− 1,510.66
Total		$72,191.23		$70,680.57

TABLE 3A. AMERICAN FARM ECONOMIC ASSOCIATION NET WORTH EXCLUSIVE OF SPECIAL GRANTS FUNDS, JUNE 30, 1954, AND JUNE 30, 1955

	June 30, 1954		June 30, 1955	
Assets				
Total assets, Table 3	$72,191.23		$70,680.57	
		$72,191.23		$70,680.57
Liabilities				
Balance, Special Grants funds	$10,298.78		$11,169.50	
Balance, Student Section	37.95		27.95	
Balance Grad. Stud. Fund	—		100.00	
		$10,336.73		$11,297.45
Net Worth		$61,854.50		$59,383.12

TABLE 4. TRANSACTIONS AND BALANCE IN SPECIAL GRANTS FUND, AFEA

	1953–54		1954–55	
Beginning balance and income				
Balance on hand, first of year.....	$11,020.68		$10,298.78	
Interest earned during year.....	275.52		257.47	
Capital contributions received.....	675.00		2,255.00	
		$11,971.20		$12,811.25
Disbursements from fund				
Awards made during year.....	$ 1,600.00		$ 1,600.00	
Exp. of operating awards program	72.42		41.75	
		$ 1,672.42		$ 1,641.75
Ending balance.....		$10,298.78		$11,169.50

REPORT OF THE EDITOR

The numbers of manuscripts being submitted to the *Journal* has continued to increase during 1955. The acceptance-rejection ratio has been held about the same as in the three previous years by publication of 192-page issues and by shortening of individual papers.

The Editor has received assistance and ready cooperation from several colleagues and this is much appreciated. George Brinegar, Associate Editor, handled the major duties of the office during the summer months, 1955, in addition to his regular contribution in reviewing articles. Thanks are due to Robert Clodius for his able handling of the Book Review section. The members of the Editorial Council have faithfully reviewed the large number of manuscripts submitted to them. Their contribution to the publication of the *Journal* has been substantial. Thanks are also due this group for helping to select the outstanding article published in the *Journal* in 1954. In addition to help from the Editorial Council, individual reviews have been received from Proctor Thomson, University of Chicago, H.C.M. Case, University of Illinois, George G. Judge, Oklahoma State College, and Samuel P. Huntington, Department of Government, Harvard University. Assistance on individual reviews was also received from several of my colleagues at the University of Connecticut. Lawrence Witt's aid in transferring the duties of the office and in advising on matters of *Journal* policy was also much appreciated.

HAROLD G. HALCROW, *Editor*

REPORT OF THE AGRICULTURAL DATA COMMITTEE

This Committee was appointed by the President of the Association early in 1955.

The membership is as follows:

George H. Aull, Head, Department of Agricultural Economics, Clemson College, Clemson, South Carolina

Frank V. Beck, Extension Economist, Rutgers University, New Brunswick, New Jersey

George T. Blanch, Head, Department of Agricultural Economics, Utah State Agricultural College, Logan, Utah

J. Carroll Bottum, Assistant Head, Agricultural Economics Department, Purdue University, Lafayette, Indiana

Dorris D. Brown, Economist, Mutual Federation of Independent Cooperatives, Inc., Syracuse, New York

Walter H. Ebling, Agricultural Statistician, P. O. Box 351, Madison, Wisconsin

George Montgomery, Head, Department of Agricultural Economics, Kansas State Agricultural College, Manhattan, Kansas

Emery C. Wilcox, Agricultural Statistician, 348 Federal Office Bldg., Seattle, Washington

Consultants to the committee are:

Joseph Ackerman, Farm Foundation, 600 S. Michigan Avenue, Chicago, Illinois

John D. Black, Professor, Harvard University, Cambridge, Massachusetts

Ray Hurley, Chief, Division of Agriculture, Bureau of the Census, Washington, D.C.

O. V. Wells, Administrator, Agricultural Marketing Service, U. S. Dept. of Agriculture, Washington, D. C.

The committee has held three meetings, April 29 and June 30 in Washington and August 2 in East Lansing, Michigan. As the work got underway, it became apparent that there are various areas that need attention and it was necessary to limit the efforts of the group to more urgent ones for the present. The problem approach has been used.

The area of state and local data was clearly one that required immediate attention. With important new developments in extension and in other agricultural services, greatly increased emphasis has come to this area and made it a live issue. At the same time, for economy reasons, the census is moving away from the historic pattern of providing detailed data for counties and other subdivisions of states, such as minor civil divisions. If agriculture is to continue to have local detailed data for the subdivisions of states from both the Census and the Crop and Livestock Reporting Service a strong case for them will need to be made. The Committee is taking steps to review the needs for this type of data and what can be done to retain them for agriculture.

Another area of need for more data work is that of more frequent reports in some of the existing series of crop, livestock and other reports now being made by the Department of Agriculture. Preliminary surveys have been made by the Committee to bring out some of the major needs in this area and the results incorporated in a panel of papers under the title "Providing More Adequate Agricultural Data," which was given on August 1 at this conference. The meeting was well attended, about 70 persons being present. A similar panel of papers on data problems is planned for the 1956 meeting of the Association.

The committee expects to proceed from here on by having subcommittees explore particular areas of need. Two such subcommittees are established:

(1) Data needs in extension, especially the new farm and home planning work. Dr. Dorris D. Brown, Chairman.

(2) The need for more frequent reports in various areas. J. Carroll Bottum, Chairman

A subcommittee on organization to survey data requirements in states, and for integrating them into a national program has also been authorized.

Action on this committee has been deferred until progress reports become available on the work of the other two subcommittees.

The Committee voted to present some of the main problems and issues in the agricultural data field to the annual meetings of the Association of Land

Grant Colleges and the National Association of Commissioners, Secretaries and Directors of Agriculture, also at the National Outlook Meeting in November.

We are especially appreciative of the splendid cooperation from many persons. Agricultural statisticians have generously supplied needed information and judgment. S. R. Newell, Chairman of the Crop Reporting Board, James E. Crosby of the Extension Service and others have attended meetings and assisted the Committee. Special acknowledgment must be made of the services and support of Dr. Joseph Ackerman and the Farm Foundation.

Respectfully submitted,
WALTER H. EBLING, *Chairman*

REPORT OF THE ACTIVITIES OF THE STUDENT SECTION OF THE AMERICAN FARM ECONOMIC ASSOCIATION

1. *Newsletter.* The editor of the *Newsletter,* Keith Bandy of Ohio State University, adopted a new format and incorporated pictures and cartoons to make an attractive publication containing many good ideas.

Fourteen student sections contributed news items, and each of these had also contributed in 1953-54. They were:

Florida	Michigan	Purdue
Illinois	Nebraska	South Dakota
Iowa	Ohio	Texas
Kansas	Oklahoma	Utah
Louisiana	Pennsylvania	

Six other clubs which contributed news items in 1953-54 (but not in 1954-55) and a new club at Clemson can probably be considered active, too. These clubs are at:

Arkansas	Missouri	North Carolina
Mississippi	Montana	Tennessee

The principal problem of the *Newsletter* this past year was in getting it distributed at the most effective time. The first issue came out the first of February (though dated December), the second in late March, and the third in June (dated May). The first issue should get out in October, if possible, the second as soon as the debate topic is chosen, and the third issue early in May.

The second problem is one of finance. Ohio State University undoubtedly had a sizeable expenditure in printing and mailing the *Newsletter.* Not all departments at which there are student sections may be willing to absorb this cost. It would seem desirable for the parent association to finance this project.

The Student Section has been extremely fortunate in securing high-caliber students to edit the *Newsletter* during its four years of existence.

2. *New student sections.* A charter was issued for a student section at the Clemson Agricultural College in May, 1955.

A student section was organized at Florida in the spring of 1954 and has carried on an active program. No copies of its constitution have been received and no charter has been issued (but they are functioning, which is most important).

3. *Program.* The Student President, William Miller of Purdue University, announced a new feature for the program at the annual meeting—a public speaking contest.

4. *Awards.* After communicating with members of the Advisory Committee, some changes in the type of awards were recommended. Dissatisfaction in having the *Journal* as the *only* award was the reason for making some changes.

5. *Finance.* Correspondence with students still indicates that some method of financial assistance in attending annual meetings would enable more sections to be represented.

The committee recommends that the Awards Committee, or any other special committee appointed by the Executive Committee, be authorized to solicit funds to carry on the student program from the national farm organizations, or foundations and/or firms that have an interest in economic problems of agriculture.

Respectfully submitted,

R. J. MUTTI, *Chairman, Advisory Committee to the Student Section*

RESULTS OF STUDENT DEBATE CONTEST, 1955

Final Rank	*Name*	*Institution*	*Award*
1	J. K. Hanes Carl Meador	Louisiana State University	Desk Pen
2 (tie)	Robert Brooks Harry Daniel	North Carolina State College	Journal of Farm Economi
2 (tie)	Ray Gieseman James Collins	Kansas State College	Journal of Farm Economi
4	Melvin Blase William Holsinger	University of Missouri and Iowa State College	
5	Warren Grant B. G. Cacandougher	Texas A & M College	
6	Robert Martin Jack Deuber	Ohio State University	

RESULTS OF STUDENT PUBLIC SPEAKING CONTEST, 1955

Final Rank	*Name*	*Institution*	*Award*
1	Robert Martin	Ohio State University	Desk Pen
2	Charles Buie	Louisiana State University	Journal of Farm Economics
3	Melvin Blase	University of Missouri	
4	Harold Bowman	Purdue University	
5	Donald Welge	Louisiana State University	
6	Russell Moffett	Michigan State University	
7	Willard Baker	Purdue University	
8	Walter Allen	Ohio State University	

REPORT ON THE ACTIVITIES OF THE SPECIAL FINANCE COMMITTEE OF THE AWARDS PROGRAM

As of July 1, 1955, the Finance Committee has succeeded in raising a total of $3,030. This covers the period January 1, 1954, to July 1, 1955.

The committee members were as follows:

Ernest T. Baughman—Henry Arthur—Chicago, Illinois
R. G. Bressler—Berkeley, California
Aubrey J. Brown—Lexington, Kentucky
Robert Kramer—East Lansing, Michigan
E. T. Savidge—Karl Butler—New York
G. B. Wood—Corvallis, Oregon

L. A. Zehner—Boston, Massachusetts
Franklin L. Parson—C. Dean McNeal—Minneapolis, Minnesota

FRANKLIN L. PARSONS, *Chairman, Finance Committee of the AFEA Awards Program*

LIST OF CONTRIBUTORS AND AMOUNTS DONATED TO THE AFEA AWARDS PROGRAM DURING 1954 AND 1955

Allied Chemical & Dye Corp., Nitrogen Division, 40 Rector St., New York 6, N.Y.	$ 200.00
American Corn Millers' Federation, Chicago, Ill	100.00
Arcady Farm Milling Co., 223 W. Jackson Blvd., Chicago 6, Ill.	100.00
E. W. Bailey & Co., Inc., Montpelier, Vt.	10.00
Bangor and Arrostock Railroad Co., Bangor, Me.	25.00
Caterpillar Tractor Co., Peoria 8, Ill.	200.00
Consolidated Rendering Co., 178 Atlantic Ave., Boston, Mass.	10.00
Continental Grain Co., Portland, Ore.	100.00
Charles M. Cox Co., 177 Milk St., Boston 19, Mass.	25.00
Dannen Mills, Inc., St. Joseph, Mo.	25.00
Deere and Co., 1325 Third Ave., Moline, Ill.	250.00
Doane Agricultural Service, Inc., 5144 Delmar Blvd., St. Louis 8, Mo.	50.00
The Farmer, Tenth & Cedar Sts., St. Paul 2, Minn.	100.00
First National Stores, Inc., 5 Middlesex Ave., Somerville, Mass.	25.00
Ford Motor Co., Detroit, Mich.	100.00
Green Giant Co., Le Sueur, Minn.	100.00
Hubbard Milling Co., Mankato, Minn.	25.00
International Harvester Co., 180 N. Michigan Ave., Chicago, Ill.	250.00
International Milling Co., Minneapolis, Minn.	250.00
Land O'Lakes Creameries, Inc., 2201 Kennedy St., N.E., Minneapolis 13, Minn.	100.00
Michigan Farm Bureau, 221 N. Cedar St., Lansing, Mich.	200.00
Norris Grain Co., 1640 Board of Trade Bldg., Chicago 4, Ill.	25.00
F. H. Peavey Co., also covering: Russell Miller Milling Co.; Van Dusen Harrington Co.; & their divisions, Minneapolis, Minn.	250.00
Pendleton Grain Growers, Inc., Pendleton, Ore.	25.00
Pillsbury Mills, Inc., Minneapolis 2, Minn.	100.00
Seattle First National Bank, Second Ave. at Cherry St., Seattle, Wash.	50.00
Standard Oil Foundation, Inc., 910 S. Michigan Ave., Chicago 80, Ill.	100.00
Strong-Scott Manufacturing Co., 451 Taft St., N.E., Minneapolis 13, Minn.	25.00
Wallace's Farmer & Iowa Homestead, 1912 Grand Ave., Des Moines, Iowa	100.00
The Yantic Grain and Products Co., 3 Cove St., Norwich, Conn.	10.00
U. S. National Bank, Portland, Ore.	100.00
Total	$3,030.00

REPORT OF THE AWARDS COMMITTEE OF THE AMERICAN FARM ECONOMIC ASSOCIATION, 1955

The Awards Committee recommends that:

(1) the three $250 awards for outstanding theses submitted in partial fulfillment of requirements for Doctor of Philosophy degrees in 1954 be granted to:

Dr. Roger Charles Woodworth of Iowa State College for his thesis entitled, "Economic Analysis of Protein-Grain Substitution Relationships in Pork Production."

Dr. Norman Zellner of the University of California for his thesis entitled, "An Economic Analysis of the California Prune Industry."

Dr. Louis M. Goreux of the University of Chicago for his thesis entitled, "Agricultural Productivity and Economic Development in France (1852-1950)."

(2) the three $250 awards for outstanding research reports published in 1954 be granted to:

Mr. Rex F. Daly of the Agricultural Marketing Service, U. S. D. A. for his article entitled, "Some Considerations in Appraising the Long-Run Prospects for Agriculture," which appeared in "Long-Range Economic Projection," National Bureau of Economic Research, 1954. (Submitted in the field of Theory and Methodology)

Mr. George C. Judge of the University of Connecticut for his bulletin entitled, "Econometric Analysis of the Demand and Supply Relationships for Eggs," Connecticut Bulletin 307, January, 1954. (Submitted in the field of Agricultural Prices)

Mr. Boris C. Swerling of Stanford University for his publication entitled, "California Agriculture and International Commodity Developments," which appeared as Supplement to Monthly Review, Federal Reserve Bank of San Francisco, January, 1954. (Submitted in the field of Agricultural Policy)

COMMENTS

The recommendations are based upon the judgment of the committee members in selecting the best theses and reports entered for consideration in accordance with the rules and procedures announced in the regular November, 1954 issue of the *Journal of Farm Economics* and in a poster distributed to all interested educational institutions and research agencies.

The theses recommendations represent a selection from 10 entries from 10 institutions. A scoresheet is attached indicating ratings by individual judges, a summary, and the final ranking.

It is recommended that the thesis by Dr. Allie Clay Felder, Jr. of Ohio State University, entitled "The Acceptance of Recommended Peanut Production and Market Practices in Nansemond County, Virginia, Relative to Family Organization, Family Values and Related Social and Economic Status Factors," receive honorable mention.

The outstanding reports were selected from 34 entries of which 13 were selected by the members of the committee for final judging. A scoresheet indicating the final rank and ratings by individual judges for the top 13 reports is attached.

It is recommended that three reports receive honorable mention: namely, the bulletin by Mr. Quentin W. Lindsey of North Carolina State College, entitled "Farm Tenure: The Framework for Long-run Adjustments in Southeastern Agriculture," N. C. Technical Bulletin No. 110, August, 1954; the report by Mr. John C. Abbott of the University of California, entitled "The Economic Implications of Recent Technical Developments in the Processing of Turkeys," Giannini Foundation Mimeographed Report No. 172, October, 1954; and the report by Mr. Harold F. Breimyer of the Agricultural Marketing Service, U. S. D. A., entitled "100 Million Cattle?" Agricultural Marketing Service Mimeo, July, 1954.

Procedure for Awards Program

The Committee for the 1955 Awards Program consisted of Dr. Raymond J. Doll, Federal Reserve Bank of Kansas City; Dr. Marshall Harris, U. S. Department of Agriculture; and Dr. Harold B. Rowe, The Brookings Institution; who judged the theses; and Dr. W. W. McPherson, North Carolina State College;

Dr. Max Brunk, Cornell University; Dr. Willard W. Cochrane, University of Minnesota; Dr. W. L. Gibson, Jr., Virginia Polytechnic Institute; Dr. W. E. Hendrix, The University of Chicago; Dr. Sidney Hoos, The University of California; and Dr. Glenn L. Johnson, Michigan State University, who judged the published reports; and Dr. H. B. James, North Carolina State College, who managed the program.

All of the thesis entries were judged independently by the 3 committee members who ranked them from 1 to 10.

The procedure for conducting the published reports program was to select and assign one judge to each of the designated subject-matter categories. Each judge screened the entries classified under his subject for the purpose of recommending those to be considered in the final judging. All of the entries recommended for final judging were reviewed by all of the judges to determine the award recipients.

The attached scoresheet was given to each judge as a means of helping him and of providing some degree of uniformity with respect to the factors and weights given consideration. A system of handicaps was suggested to the judges to allow for dual authorship and for inelligible co-authors. For each additional eligible author beyond one, the 5-point handicap was suggested, and for each ineligible co-author, a handicap of 10 points was suggested.

Questions of Procedure for Consideration by the Executive Committee

(1) Should criteria be specified for use by judges in selecting winning theses? If so, what criteria should be used?

(2) Should we continue to classify all reports into seven fields as we have done in the past? The problem of classification is a difficult one and many publications could logically be placed in more than one category. Also, it should be noted that there have been no entries in Agricultural Finance in the last two years.

H. BROOKS JAMES, *Chairman*
Awards Committee

REPORT OF THE ELECTION TELLERS

The count of the ballots showed the following officers elected for 1955-56:

President-Elect ..... H. Brooks James
Vice-President ..... Karl A. Fox
Lawrence W. Witt
Secretary-Treasurer ..... Lowell S. Hardin

Tellers: MERVIN G. SMITH, Ohio State University, Chairman
J. H. ATKINSON, Purdue University
J. H. BLACKSTONE, Alabama Polytechnic Inst.
S. A. ENGENE, University of Minnesota
A. W. EPP, University of Nebraska
MERRILL B. EVANS, Ohio State University
HARALD R. JENSEN, University of Kentucky
LAWRENCE E. KREIDER, Federal Reserve Bank, St. Louis
ROBERT B. SCHWART, Ohio State University
MORRIS WHITE, Alabama Polytechnic Institute

MINUTES OF THE EXECUTIVE COMMITTEE MEETING, WEDNESDAY, AUGUST 3, 1955

Present: Ackerman, Cochrane, Cowden, Calhoun, Brandt, Hardin, Halcrow, Fox, Witt, James.

The meeting was called to order by President Brandt. The minutes of the July 31 meeting were approved.

President Brandt proposed that the Executive Committee meet next at the close of the winter meetings, December 30, 1955, at a dinner meeting in New York City. This meeting will be held for those who can attend at no expense to the Association.

Immediate past President Ackerman was appointed Chairman of a committee to develop a program for increased graduate student attendance and participation in annual meetings of the Association. This involves the development of the program itself and a plan for acquiring funds for its support. Vice President Fox was also appointed to this committee.

In answer to policy questions raised by Editor Halcrow, the following conclusions were reached. The present policy of publishing papers presented at the annual meeting will be continued. This policy involves editing at the discretion of the Editor to keep papers within this space suggested in the original time limits of the initial assignment. The Editor was authorized to increase the size of the regular issues of the *Journal* above the stated 192 pages if material justified. It was understood that this would apply to only one or two issues and primarily to accommodate worth-while papers presented at the winter meetings. The possibility of an extra issue of the *Journal* for 1956-57 was taken under study. The Editor was authorized to change our present policy to provide free of charge 100 reprints of all notes carried in the *Journal*. It was pointed out that the publication responsibility of the *Journal of Farm Economics* included provision of adequate outlet for materials developed within the various areas in the field and for the different geographic sections of the country.

The President indicated that he would appoint a new chairman of the Awards Committee. The possibility of lowering the awards from $250 to $100 was considered but no action was taken.

Vice President Witt was given the responsibility of developing the Student Section during the year and handling it at the next annual meeting.

The recommendation of the Employment Committee was not accepted. It was agreed that the service provided at Michigan State University in the form of a meeting place for employees and for employers would be continued next year but that no *Journal* listing would be made at this time.

No felt need was expressed for action at the present time on the matter of producing under Association sponsorship another volume of readings in some field of agricultural economics.

President Brandt indicated that he would probably appoint a committee to explore the possibilities of means of recognizing persons who have rendered long and distinguished service in the field of agricultural economics. It was generally agreed that once this committee's recommendations were available, the program would be presented to the total membership for action.

The 1955-56 budget for the Association was approved as follows:

AMERICAN FARM ECONOMIC ASSOCIATION
BUDGET FOR 1955-56

Item	Actual		Budget Proposed	
	1953-54	1954-55	1954-55	1955-56
Income				
Dues	$12,320.71	$12,012.57	$12,500	$17,000
Sales of back issues	1,046.25	454.55	1,100	950
Sale of reprints	812.46	806.05	800	800
Advertising	300.00	300.00	300	300
Undergraduate Student Section	20.40	—	—	—
Interest	697.25	737.45	600	600
Dividends	2,223.00	2,699.72	2,400	2,800
Sale of membership lists, misc.	44.51	16.50	100	50
Total	$17,464.58	$17,026.84	$17,800	$22,500
Expenses				
Journal printing	$12,147.22	$15,334.96	$13,600	$18,000
Editing fees	402.50	934.00	800	1,100
Reprints	1,162.60	1,141.12	1,300	1,200
Purchase of back issues	50.00	592.00	500	50
Sudent Chapters, awards	—	10.00	—	150
Annual meeting (net)	749.71	381.82	500	900
Postage and Telegrams	151.70	335.20	200	300
Office supplies and expenses	422.76	456.64	400	400
Membership lists		37.26		
Subscription refunds	25.18	27.75	200	120
Miscellaneous				
Interest to awards program	275.52	257.47	300	280
Total	$15,387.19	$19,508.22	$17,800	$22,500
Net Gain or Loss	$+2,077.39	$−2,481.38	$ 0	$ 0

President Elect James will investigate possible meeting sites in the Southeast for 1957 meetings.

Adjournment.

L. S. HARDIN, *Secretary-Treasurer*

MINUTES OF MEETING OF EXECUTIVE COMMITTEE, AMERICAN FARM ECONOMIC ASSOCIATION, COMMODORE HOTEL, DECEMBER 30, 1955

Present: Brandt, James, Halcrow, Ackerman, Witt, Hardin and guests Brinegar, Haythorne and Ebling

1. President Brandt expressed the Association's appreciation to New York local arrangements committee members W. M. Curtiss, F. M. Atchley and C. J. Blanford. Seventy-seven association members attended the Wednesday night dinner and 55 were present for the Thursday luncheon arranged in connection with the joint meetings.

2. The need for more frequent meetings of the Executive Committee was expressed in view of the increasing complexity of the Association's activities.

3. Possibilities of increasing the advertising revenue from the *Journal* were discussed. Present advertising content varies from one to three pages per issue at $35 per page. It was agreed that an increase in advertising is desirable and that personal contact with potential advertisers is essential.

It was moved that the President appoint a person or persons in the New York area to assist the Editor to investigate the possibilities of increasing advertising revenue from the *Journal*. Carried.

4. The Editor was authorized to canvass degree-granting institutions for names and tentative theses titles of students planning to complete M.S. or Ph.D. degrees in 1956. He will also obtain similar information on students who completed degrees in 1955. These will be carried in the *Journal*. Previously, only the recipients of Ph.D. degrees have been listed. It was understood that this action concerning publication of the M.S. list would be reviewed by the Executive Committee at its August, 1956, meeting.

5. The Editor was further authorized to obtain and publish in the *Journal* a list of fellowships and assistantships available in the field of agricultural economics in the U.S. It was agreed that such a listing should be published annually.

6. Effective with the new schedule of membership dues in 1956, single issues of the *Journal* are to be priced at $1.75 rather than at the previous $1.25 rate.

7. President Brandt extended a special invitation to Dr. Haythorne and his colleagues in the Canadian Agricultural Economics Society to attend the AFEA 1956 annual meeting in California.

8. President Brandt discussed detailed plans for the 1956 meetings to be held jointly with the Western Farm Economic Association, August 27, 28 and 29 at Asilomar, Pacific Grove, California. The theme of the meetings will be Agricultural and Economic Growth and Stability. A two or three day field trip to study California agriculture is being arranged immediately preceding the meetings for those who care to participate. Meeting details will be worked out and mailed to the membership in late March.

9. Dr. Haythorne extended an invitation to association members to attend the annual meetings of the Canadian Agricultural Economists at Toronto in June, 1956.

10. Publication by the Association of a membership directory was author-

ized. It is expected that this directory will list membership in the Association as of June 30, 1956. This directory will carry a short biographical sketch on each man. A committee is to be appointed to produce the directory. It is expected that this committee will work closely with the membership committee (minute 11).

11. Appointment of a membership committee to undertake a concerted membership drive was authorized.

12. The possibility of the Association's publishing a roster of consulting agricultural economists was discussed. It was agreed that publication of a membership directory would partially fill this need, as well as meet the broader need.

13. Mr. Walter Ebling presented a progress statement on the work of the Agricultural Data Committee. The committee will make its progress reports available to the Executive Committee and will submit a formal report to the membership at the next annual meeting.

14. It was agreed that the President should appoint a small committee to study and bring together in one place the rules and policies of the Association. Such a compilation should be of material assistance to the officers and membership.

15. The possibility of a survey on mathematics as an econometric tool in agricultural economics was discussed. It was agreed that President Elect James should give this matter consideration during the next year. He is uniquely situated to do so in view of his work with the Social Science Research Council in this area.

16. President Brandt announced that Dr. William Nicholls was assuming over-all chairmanship of the Awards Committee activities. He further indicated that Harold Halcrow had been nominated for membership on the board of the National Bureau of Economic Research to represent the Association. Absence of AFEA representation on the board of the Social Science Research Council was noted.

17. Recognition was made of previous authorization for the President to create a committee to study the possibilities of Association recognition of eminent agricultural economists.

18. The invitation from Florida officials to hold the 1957 meetings at Gainesville was received with grateful appreciation. Although the campus facilities and arrangements were judged to be excellent, it was felt that it probably would be wiser to hold the 1957 meetings geographically nearer larger numbers of Association members. Since the Association had already indicated a desire to meet in the Southeast in 1957, the Council unanimously agreed that the site of Lake Junaluska Methodist Assembly in the vicinity of Asheville, North Carolina was the most desirable alternative open. Accordingly, the 1957 meetings were set for August 28-31, at Lake Junaluska. Brooks James will make the arrangements with the assembly management. The staff at North Carolina State College will handle local arrangements.

19. It was agreed that another Executive Committee meeting might be called in Chicago in the spring or early summer.

20. The meeting locations for the American Economic Association annual meetings (December) were noted as follows: 1956, Cleveland; 1957, Philadelphia; 1958, Chicago.

Respectfully submitted,

LOWELL S. HARDIN, *Secretary-Treasurer*

INDEX TO VOLUME XXXVII

1955

SUBJECTS

Activity Analysis
Linear Programming as a Tool in Farm Management Analysis, 1222
Activity Analysis: An Agricultural Marketing Tool, 1236
Intergrating Crop and Livestock Activities in Farm Management Activity Analysis, 1249
Discussions: 1258, 1261, 1263
Activity Analysis: An Agricultural Marketing Tool, 1236
Adjustment Problems in a Growing Economy
Adjustments in Production to a Growing Economy, 1060
Adjustments in a Growing Economy—Social Considerations, 1070
Low-Income Problems in a High-Employment Economy, 1083
Discussions: 1090, 1091, 1093
Agricultural Economics, The Orientation of, 793
Agricultural Financing
Reorientation of Policies in Agricultural Financing, 928
Measuring Risk in Farm Mortgage Lending, 941
Influence of Trade Credit on Broiler Production, 950
Discussions: 959, 963, 965
Agricultural Financing, Reorientation of Policies in, 928
Agricultural Land Use Problems, Integration of Law and Economics in Analyzing, 1126
Agricultural Marketing, Recent Econometric Studies in
An Econometric Model of the Watermelon Market, 237
Management of Meat Inventories, 252
Synthetic Method of Cost Analysis in Agricultural Marketing Firms, 270
Discussion: 279
Agricultural Outlook Work, National and International, 368
Agricultural Policy, Countervailing Power and, 555
Agricultural Policy Research, Methodological Problems in, 1316
Agricultural Price Policy, What Can a Research Man Do in, 305
Agricultural Population in the United States, Classification of the, 511

Benefit-Cost Analysis and Public Resource Development, 676
"Bigness" Argument in Agricultural Economics, The Proper Place of, 130
Broiler Production, Influence of Trade Credit on, 950

Cattle on Feed, Estimating, 127
Consumer Demand for Cigarettes Estimated from State Data, 690
Consumer Knowledge of Quality Determining Factors in Eggs, 625
Consumer Preferences, The Measurement of, 638
Crop and Livestock Reports, Needed Changes in State and Local, 1050

Dairy Problem and a Suggested Solution, The, 1005
Dairy Production and Marketing Problems
The Impact of Technological Changes on Milk Production, 996
The Dairy Problem and a Suggested Solution, 1005
Economic Problems Associated with Milk Marketing Orders, 1016
Discussions: 1021, 1023, 1025
Data More Available and Useful, Making Existing Local, 1030
Data Requirements by Areas: How Can They Be Met?, New, 1038
Data Wanted by Business Firms, Local, 1047
Decision Making by Poultry Firms, Impact of Price Expectations and Uncertainties in, 652
Decision Making Studies: The Friedman-Savage Utility Hypothesis in the Interstate Managerial Study, 1110
Decision Making Studies: The Nature of the Study, 1097
Decision Making Studies: Possible Implications of Decision Making Studies for Farm Management Teaching and Research, 1119
Decision Making Studies: Possible Implications of the North Central In-

terstate Managerial Study for Farm and Home Development Programs, 1122
Decision Making Studies: Sociological Aspects of the Decision Making Process, 1115
Decision Making Studies: Some Problems of Method in the Interstate Managerial Survey, 1105
Decision Making Studies: The Universe of Farms Studied, 1102
Demand Analysis
How Much Progress Has Been Made in the Study of the Demand for Farm Products?, 968
A Comparison of Single and Simultaneous Equation Techniques, 975
Discussions: 990, 992
Demand Analysis, Ogive Curves in a, 560
Demand for Farm Products, Changes in the Structure of, 411
Demand for Farm Products?, How Much Progress has been made in the Study of the, 968
Demand for Food, The Place of Consumer Education in Increasing the, 1370
Demand for Food, The Place of Merchandising and Promotion in Expanding the, 1380
Demand for Foods, The Economic Need for Advertising Programs to Stimulate the, 1474
Depreciation Under the Internal Revenue Code of 1954, Alternative Methods of Figuring, 484

Econometric Results in Agriculture, Surveys of
Demand and Prices, 197
Results from Production Economic Analysis, 206
Sample Surveys and Experimental Design, 223
Discussions: 233, 235
Economic and Agricultural Policy, Problems of Order of, 25
Economic Growth and Development
Conditions and Rates of Economic Growth, 807
Contributions of Agricultural Policies to General Economic Growth, 821
Discussions: 834, 837
Economic Growth, Conditions and Rates of, 807
Economic Growth, Contributions of Agricultural Policies to General, 821
Economic Implications of Farm and Home Planning Work
The Role of an Agricultural Economist in a Farm and Home Development Program—from an Administrator's Viewpoint, 840
Organizing Economic Research Specifically for Use in a Farm and Home Development Program, 848
Discussions: 857, 859, 863
Economic-Legal Approach to Agricultural Problems
Integration of Law and Economics in Analyzing Agricultural Land Use Problems, 1126
Making Land Laws Serve Economic Ends, 1143
Discussions: 1153, 1157
"Economic Nature of the Cooperative Association," Comments on, 140
Economics of Forage Production and Utilization, Problems of Research, in the, 1440
Economics of Forage Production and Utilization, The
Problems of Research in the Economics of Forage Production and Utilization, 1440
Economic Application of Forage Production and Utilization Research, 1448
Economics of Forage Evaluation, 1457
Discussions: 1460, 1461, 1463
Economics of Soil Conservation, How Certain Factors Affect the, 132
Economics of the Control and Use of Water, The
The Development and Present Status of Water Rights and Water Policy in the United States, 866
Some Economic Issues in Water Rights, 875
Organization and Administrative Arrangements for an Effective Water Policy, 886
Discussions: 897, 899, 901
Economy, Adjustments in Production to to a Growing, 1060
Economy—Social Considerations, Adjustments in a Growing, 1070
Efficiency within American Agriculture, 524
Ely, Richard T., 146
Evaluation of Extension Methods Em-

ployed in Farm and Home Development
Evaluation of Extension Methods Used in Farm and Home Development in the Midwest, 1278
Evaluation of Extension Methods Employed in Farm and Home Development in the Northeast, 1286
Evaluation of Extension Methods Employed in Farm and Home Development in the South, 1293
Evaluation of Extension Methods Employed in Farm and Home Development in the West, 1298
Evaluating Extension Methods Used in Farm and Home Development: Reappraisal, 1302
Export Programs, Impact and Problems in Administration of, 96

Factors and Fundamentals, 739
Farm and Home Development in the Midwest, Evaluation of Extension Methods Used in, 1278
Farm and Home Development in the Northeast, Evaluation of Extension Methods Employed in, 1286
Farm and Home Development in the South, Evaluation of Extension Methods Employed in, 1293
Farm and Home Development in the West, Evaluation of Extension Methods Employed in, 1298
Farm and Home Development Program—From an Administrator's Viewpoint, The Role of an Agricultural Economist in a, 840
Farm and Home Development Program, Organizing Economic Research Specifically for Use in a, 848
Farm and Home Development: Reappraisal, Evaluating Extension Methods Used in, 1302
Farm and Home Development Work, An Extension Philosophy for, 493
Farm Management Activity Analysis, Integrating Crop and Livestock Activities in, 1249
Farm Mortgage Lending, Measuring Risk in, 941
Farm Policy, Applying Welfare Economics to, 1266
Farm Policy: The Current Position, 292
Farm Price Policy and the Farm Vote, 601
Farm Technological Advance and Total Population Growth, 120
Farm Tenancy and Costs of Borrowing, 358
Farm Tenure Arrangements, The Application of Efficiency to, 1341
Farmers' Reactions to Uncertain Price Expectations, A Study of, 90
Farms Classified by Size, Trends in Number of, 506
Feed Mix Problems, Solving Minimum-Cost, 135
Fertilizer Production Surface, Review Notes on the Heady-Pesek, 117
Food Advertising and Promotion, Economic Aspects of, 1465
Forage Evaluation, Economics of, 1457
Forage Production and Utilization Research, Economic Application of, 1448
Frozen Food Distribution Research, Industry Cooperation in, 1204
Fruit and Vegetable Packing House Efficiency, Industry Cooperation in Studies of, 1209

Geographic Differences in Returns to Iowa Farmers: 1869-1950, 342

Heady-Pesek Fertilizer Production Function, Further Comment on the, 566
Hutton and Thorne on Isoclines: A Reply, 363

Industry, Assistance Available from, 1202
Industry Cooperation in Marketing Research
Assistance Available from Industry, 1202
Industry Cooperation in Frozen Food Distribution Research, 1204
Industry Cooperation in Studies of Fruit and Vegetable Packing House Efficiency, 1209
Industry Cooperation in Marketing Facilities Studies, 1215
Industry Cooperation in Marketing Research—Potential Opportunities, 1219
Integration of Research and Extension in Agricultural Policy
Increasing Farmers' Understanding of Public Problems and Policies, 1307
Methodological Problems in Agricultural Policy Research, 1316
Discussions: 1324, 1327, 1329

Japan Needs U. S. Surplus Food, 125
Journal of Farm Economics—A Further Comment, 114
Journal of Farm Economics—Some Additional Information, 116

Land Laws Serve Economic Ends, Making, 1143
Land Tenure Research: Linear Programming and Single Equation Models, Two Empirical Techniques Applicable to, 1354
Land Tenure Within the Efficiency Concept, A Framework for Orienting Research in, 1333
Linear Programming Analysis, Perfect vs. Discontinuous Input Markets: A, 538
Linear Programming and Farm Management Analysis, 1
Linear Programming as a Tool in Farm Management Analysis, 1222
Long's Reply on the Value Question, Rejoinder to, 144
Low-Income Farm Problem, Economics of the, 1408
Low-Income Farm Problems, Part-Time Farming and the, 1428
Low-Income Farm Problem, Sociological Aspects of the, 1417
Low-Income Farm Problem, The
  Trends and Characteristics of Farm Population in Low-Income Farming Areas, 1399
  Economics of the Low-Income Farm Problem, 1408
  Sociological Aspects of the Low-Income Farm Problem, 1417
  Part-Time Farming and the Low-Income Farm Problem, 1428
  Discussions: 1435, 1438
Low-Income Farmers, Problem of the, 353
Low-Income Farming Areas, Trends and Characteristics of Farm Population, 1399
Low-Income Problems in a High-Employment Economy, 1083

Market Prices, Welfare Implications of, 904
Market Reports—They Can Be Improved, Livestock and Grain, 461
Marketing Facilities Studies, Industry Cooperation in, 1215
Marketing Research and Extension, Welfare Implications of Efficiency and Technological Improvements in, 912
Marketing Research—Potential Opportunities, Industry Cooperation in, 1219
Mathematical Programming Problems, A Row Sum Check Upon Computational Accuracy in, 734
Methods of Increasing Domestic Consumption of Farm Products, A Further Note on, 110
Mexico, Agricultural Development in, 72
Milk Marketing Orders, Economic Problems Associated with, 1016
Multiple-Owner Integration in the Broiler Industry, Aspects of, 81

Objectives of Marketing Education Programs
  The Place of Consumer Education in Increasing the Demand for Food, 1370
  The Place of Merchandising and Promotion in Expanding the Demand for Food, 1380
  Predicting Market Acceptance, 1387
  Discussions: 1394, 1395

Percentage Depletion: A Consideration of Its Applicability to Income from Farming, 315
Policy Formulation and Economic Literacy, 1271
Political Economy Reconsidered
  Applying Welfare Economics to Farm Policy, 1266
  Policy Formulation and Economic Literacy, 1271
Political Environment of Policy Making, The Agricultural Economist in the, 189
Predicting Market Acceptance, 1387
Price Expectations, Reactions to Uncertain, 559
Price Program for Agriculture, A Modified Compensatory, 716
Price Supports, Benefits Versus Costs of, 731
Profit Combination of Livestock Enterprises and Crop Rotations, Selection of Maximum, 546
Programming with Consideration of Variations in Input Coefficients, 333
Progress and Problems in Decision Making Studies
  The Nature of the Study, 1097
  The Universe of Farms Studied, 1102

Some Problems of Method in the Interstate Managerial Survey, 1105
The Friedman-Savage Utility Hypothesis in the Interstate Managerial Study, 1110
Sociological Aspects of the Decision Making Process, 1115
Possible Implications of Decision Making Studies for Farm Management Teaching and Research, 1119
Possible Implications of the North Central Interstate Managerial Study for Farm and Home Development Programs, 1122
Prospecting A Dry Hole, 360
Provide More Adequate Agricultural Data
Making Existing Local Data More Available and Useful, 1030
New Data Requirements by Areas: How Can They be Met?, 1038
Local Data Wanted by Business Firms, 1047
Needed Changes in State and Local Crop and Livestock Reports, 1050
Discussions: 1053, 1056, 1057, 1058
Public Problems and Policies, Increasing Farmers' Understanding of, 1307

Railroad Transportation of Florida Produce, The Elasticity of Demand for, 452
Relative Efficiencies of Alternative Tenure Systems
A Framework for Orienting Research in Land Tenure Within the Efficiency Concept, 1333
The Application of Efficiency to Farm Tenure Arrangements, 1341
Two Empirical Techniques Applicable to Land Tenure Research: Linear Programming and Single Equation Models, 1354
Discussions: 1363, 1367
Resale Milk Price Control—Outmoded and Antisocial?, 280
Rural Merchandising in the Alabama Black Belt, 705

Single and Simultaneous Equation Techniques, A Comparison of, 975
Statistical Analysis of Factors that Affect Prices of Coffee, A, 429
Supply Analysis
Conceptualizing the Supply Relation in Agriculture, 1161
The Wheat Supply Function, 1177
The Supply Elasticity for Milk in the Short Run, 1186
Discussions: 1197, 1199
Supply Elasticity for Milk in the Short Run, The, 1186
Supply Function, The Wheat, 1177
Supply Relation in Agriculture, Conceptualizing the, 1161

Technological Changes on Milk Production, The Impact of, 996
Truck Transportation, Agricultural Interest in the Regulation of, 439

U. S. Agriculture, Colin Clark on the Future of, 121
Urban-Industrial Development on Agriculture in the Tennessee Valley and the Southeast, The Impact of, 38

Valuation for Tax Assessment. A Method of Farm Real Estate, 471
Value Productivity Analysis, Problems of Factor-Product Aggregations in Cobb-Douglas, 664
Value Productivity Studies, Adjusting for Changes in Price Levels in, 563
Variability of Returns from the Hog Enterprise, 736

Water Policy, Organization and Administrative Arrangements for an Effective, 886
Water Rights and Water Policy in the United States, The Development and Present Status of, 866
Water Rights, Some Economic Issues in, 875
Welfare Implications in Marketing Research and Extension
Welfare Implications of Market Prices, 904
Welfare Implications of Efficiency and Technological Improvements in Marketing Research and Extension, 912
Discussions: 923, 926
What is the Food Industry Doing to Stimulate the Demand for Food?
Economic Aspects of Food Advertising and Promotion, 1465
The Economic Need for Advertising

Programs to Stimulate the Demand for Foods, 1474
Discussions: 1484, 1487
World Agriculture, Resource Use and Productivity in, 57

AUTHORS

Aandahl, A. R. and others
A Method of Farm Real Estate Valuation for Tax Assessment, 471
Aresvik, Oddvar
Comments on "Economic Nature of the Cooperative Association," 140

Babbar, M. M. and others
Programming with Consideration of Variations in Input Coefficients, 333
Bachman, Kenneth L.
Economics of the Low-Income Farm Problem, 1408
Bachmura, Frank T.
Geographic Differences in Returns to Iowa Farmers: 1869-1950, 342
Barlowe, Raleigh
Discussion: The Development and Present Status of Water Rights and Water Policy in the United States, 897
Baughman, Ernest T.
Discussion: Reorientation of Policies in Agricultural Finance, 959
Bean, Louis H.
Discussion: Conceptualizing the Supply Relation in Agriculture, 1197
Beck, Frank V.
Making Existing Local Data More Available and Useful, 1030
Beuscher, J. H.
Making Land Laws Serve Economic Ends, 1143
Bhattacharjee, Jyoti P.
Resource Use and Productivity in World Agriculture, 57
Bishop, Charles E.
Part-Time Farming and the Low-Income Farm Problem, 1428
See Reviews (Gray, Roger W.), 161
Bitting, H. Wayne
Industry Cooperation in Frozen Food Distribution Research, 1204
Black, Guy
Agricultural Interest in the Regulation of Truck Transportation, 439
Synthetic Method of Cost Analysis in Agricultural Marketing Firms, 270
Black, John D.
Colin Clark on the Future of U. S. Agriculture, 121
Problem of the Low-Income Farmers, 353
Blackstone, J. H.
Discussion: Influence of Trade Financing on Broiler Production, 965
Blanch, George T.
New Data Requirements by Areas: How Can They Be Met?, 1038
Blosser, R. H.
How Certain Factors Affect the Economics of Soil Conservation, 132
Boan, J. A.
A Study of Farmers' Reactions to Uncertain Price Expectations, 90
Boles, James N.
Linear Programming and Farm Management Analysis, 1
Borum, C. J.
Discussion: New Data Requirements by Areas: How Can They Be Met?, 1056
Botts, Ralph R. and Haygood, Tyler F.
Alternative Methods of Figuring Depreciation Under the Internal Revenue Code of 1954, 484
Bottum, J. Carroll
Increasing Farmers' Understanding of Public Problems and Policies, 1307
Bowlen, B. J.
The Wheat Supply Function, 1177
Brabant, Stuart
Discussion: Implications of Farm and Home Planning from the County Extension Worker's Viewpoint, 857
Brandow, G. E.
A Modified Compensatory Price Program for Agriculture, 716
Methodological Problems in Agricultural Policy Research, 1316
Brandt, Karl
The Orientation of Agricultural Economics, 793
See Reviews (Dewhurst, J. Frederic), 746
Bressler, R. G., Jr., and Clarke, D. A., Jr.
Resale Milk Price Control—Outmoded and Antisocial?, 280
Brewster, John M.
Farm Technological Advance and Total Population Growth, 120

Brinegar, George K.
Measuring Risk in Farm Mortgage Lending, 941
Brooke, Donald L.
Discussion: Welfare Implications of Market Prices, 923
Brown, Dorris D.
Local Data Wanted by Business Firms, 1047
Brownlee, O. H.
Applying Welfare Economics to Farm Policy, 1266
Brunk, Max E.
Sample Surveys and Experimental Design, 223
Butz, Earl L.
Policy Formulation and Economic Literacy, 1271
The Agricultural Economist in the Political Environment of Policy Making, 189

Campbell, Keith O.
See Reviews (Crawford, J. G.), 164
Castle, Emery N.
See Reviews (Beneke, Raymond R.), 768
Cavin, James P. and Waugh, Frederick V.
Contributions of Agricultural Policies to General Economic Growth, 821
Chyrst, Walter E.
A Framework for Orienting Research in Land Tenure Within the Efficiency Concept, 1333
Ciriacy-Wantrup, S. V.
Benefit-Cost Analysis and Public Resource Development, 676
Some Economic Issues in Water Rights, 875
Clarke, D. A., Jr., and Bressler, R. G., Jr.
Resale Milk Price Control—Outmoded and Antisocial?, 280
Clifton, E. S.
Discussion: Economic Aspects of Food Advertising and Promotion, 1484
Clodius, Robert L.
Adjustments in a Growing Economy—Social Considerations, 1070
Cochrane, Willard W.
Conceptualizing the Supply Relation in Agriculture, 1161
See Reviews (Halcrow, Harold G.), 583
See Reviews (Tostlebe, Alvin S.), 166
Cook, Hugh L.
See Reviews (Spencer, Leland), 762
Crossmon, B. D.
Discussion: Economic Application of Forage Production and Utilization Research, 1461
Crow, William C.
Industry Cooperation in Marketing Facilities Studies, 1215

Dahl, Reynold P.
Discussion: Measuring Risk in Farm Mortgage Lending, 963
Day, Lee M. and Staniforth, Sydney D.
Organizing Economic Research Specifically for Use in a Farm and Home Development Program, 848
DeGraff, Herrell
Economic Aspects of Food Advertising and Promotion, 1465
Detlefsen, Guy-Robert
The Economic Need for Advertising Programs to Stimulate the Demand for Foods, 1474
Dorner, Peter
An Extension Philosophy for Farm and Home Development Work, 493
Dorner, Peter and Penn, Raymond J.
Discussion: Increasing Farmers' Understanding of Public Problems and Policies, 1324
Drayton, L. E.
Reactions to Uncertain Price Expectations, 559
Ducoff, Louis J.
Classification of the Agriculture Population in the United States, 511
Trends and Characteristics of Farm Population in Low-Income Farming Areas, 1399
Dunn, Edgar S., Jr.
See Reviews (Lösch, August), 376

Eckstein, Alexander
See Reviews (Hambidge, Gove), 764
Ellickson, John C.
Trends in Number of Farms Classified by Size, 506
Ellis, Howard S.
Conditions and Rates of Economic Growth, 807
Engberg, R. C.
Reorientation of Policies in Agricultural Financing, 928
Engene, S. A.
Discussion: Problems of Research in

the Economics of Forage Production and Utilization, 1460

Feder, Ernest
See Reviews (Coates, Glenn R.), 177
Fellows, Irving F.
Economic Application of Forage Production and Utilization Research, 1448
Finler, Bennett
Percentage Depletion: A Consideration of Its Applicability to Income From Farming, 315
Fisher, Walter D.
Discussion: How Much Progress has Been Made in the Study of the Demand for Farm Products?, 990
Foote, Richard J.
A Comparison of Single and Simultaneous Equation Techniques, 975
Demand and Prices, 197
Foote, Richard J. and Hopp, Henry
A Statistical Analysis of Factors that Affect Prices of Coffee, 429
Fox, Karl A.
Changes in the Structure of Demand for Farm Products, 411
Low-Income Problems in a High-Employment Economy, 1083
Fox, Kirk
Discussion: Activity Analysis: An Agricultural Marketing Tool, 1261
French, B. C.
Industry Cooperation in Studies of Fruit and Vegetable Packing House Efficiency, 1209
French, Charles E.
Activity Analysis: An Agricultural Marketing Tool, 1236

Galbraith, J. K.
Farm Policy: The Current Position, 292
Garver, Walter B.
Discussion: What is the Food Industry Doing to Stimulate the Demand for Food?, 1487
Gaumnitz, E. W.
Economic Problems Associated with Milk Marketing Orders, 1016
Gerald, John O.
Influence of Trade Credit on Broiler Production, 950
Gilbert, Samuel J.
Discussion: Needed Changes in State and Local Crop and Livestock Reports, 1058
Greenshields, Elco L.
Discussion: Some Economic Issues in Water Rights, 899

Hadley, N. S.
Evaluating Extension Methods Used in Farm and Home Development in the Midwest, 1278
Halvorson, Harlow W.
The Supply Elasticity for Milk in the Short Run, 1186
See Reviews (Stone, Richard), 586
Hardesty, R. D.
Assistance Available from Industry, 1202
Hardin, Charles M.
Farm Price Policy and the Farm Vote, 601
Hardin, Lowell S.
Possible Implications of Decision Making Studies for Farm Management Teaching and Research, 1119
Hardin, Lowell S. and Johnson, Glenn L.
Economics of Forage Evaluation, 1457
Harrell, Cleon and Tolley, George
Management of Meat Inventories, 252
Haver, Cecil B.
The Universe of Farms Studied, 1102
Haygood, Tyler F. and Botts, Ralph R.
Alternative Methods of Figuring Depreciation Under the Internal Revenue Code of 1954, 484
Heady, Earl O.
Adjustments in Production to a Growing Economy, 1060
Possible Implications of the North Central Interstate Managerial Study for Farm and Home Development Programs, 1122
Heady, Earl O. and Pesek, John
Errata, 117
Hutton and Thorne on Isoclines: A Reply, 363
Heady, Earl O. and Strand, Edwin G.
Efficiency within American Agriculture, 524
Heady, Earl O. and others
Programming with Consideration of Variations in Input Coefficients, 333
Heisig, Carl P.
Discussion: Economics of Forage Evaluation, 1463
Hendrix, W. E.
Discussion: Relative Efficiencies of Alternative Tenure Systems, 1367
Hieronymus, T. A.

Welfare Implications of Market Prices, 904
Hildreth, R. J.
Discussion: Integrating Crop and Livestock Activities in Farm Management Activity Analysis, 1263
Hillman, Jimmye S.
Impact and Problems in Administration of Export Programs, 96
See Reviews (Randall, C. B.), 385
Hoos, Sidney
See Reviews (af Heurlin, Lauri O.), 759
Hopp, Henry and Foote, Richard J.
A Statistical Analysis of Factors that Affect Prices of Coffee, 429
Horton, Donald C.
See Reviews (Smithies, Arthur), 770
Hunt, K. E.
See Reviews (Tinley, J. M.), 175
Hurlburt, Virgil L.
Discussion: Relative Efficiencies of Alternative Tenure Systems, 1363
Hutchins, Wells A.
The Development and Present Status of Water Rights and Water Policy in the United States, 866
Hutton, R. F.
A Row Sum Check Upon Computation Accuracy in Mathematical Programming Problems, 734
Further Comment on the Heady-Pesek Fertilizer Production Function, 566
Hutton, R. F. and Thorne, D. W.
Review Notes on the Heady-Pesek Fertilizer Production Surface, 117

James, H. Brooks
Discussion: Adjustments in Production to a Growing Economy, 1090
See Reviews (Mighell, Ronald L.), 767
Jensen, Harald R.
The Nature of the Study, 1097
Jesness, O. B.
Discussion: Contributions of Agricultural Policies to General Economic Growth, 837
Johnson, D. Gale
Discussion: Surveys of Econometric Results in Agriculture, 233
Johnson, Glenn L.
Results from Production Economic Analysis, 206
The Friedman-Savage Utility Hypothesis in the Interstate Managerial Study, 1110
Johnson, Glenn L. and Hardin, Lowell S.
Economics of Forage Evaluation, 1457
Johnston, P. E.
Discussion: Organizing Economic Research Specifically for Use in a Farm and Home Development Program, 863
Jordan, G. L.
Discussion: The Wheat Supply Function and Supply Elasticity for Milk, 1199
Judge, George G.
Discussion: A Comparison of Single and Simultaneous Equation Techniques, 992
See Reviews (Dunn, Edgar S. Jr.), 577
Judge, G. G. and Morrison, T. C.
Impact of Price Expectations and Uncertainties in Decision Making by Poultry Firms, 652

Kanel, Don
Discussion: Integration of Research in Law and Economics as Applied to Agriculture, 1153
Kellogg, Charles E.
See Reviews (Russell, E. John), 574
Knapp, Joseph G.
See Reviews (Kaplan, A. D. H.), 158
Kohls, R. L.
Journal of Farm Economics Content—A Further Comment, 114
The Place of Merchandising and Promotion in Expanding the Demand for Food, 1380
Kohls, R. L., and Wiley, J. W.
Aspects of Multiple-Owner Integration in the Broiler Industry, 81
Kohn, Paul
Agricultural Outlook Work, National and International, 868
Koller, E. Fred
Discussion: The Dairy Problem and some Alternative Solutions, 1023
Koo, Anthony K. C.
Benefits Versus Costs of Price Supports, 731
Kramer, Robert C.
The Place of Consumer Education in Increasing the Demand for Food, 1370
Kriesel, Herbert C.
The Dairy Problem and Some Alternative Solutions, 1005
Kristjanson, L. B. and others
A Method of Farm Real Estate Valua-

tion for Tax Assessment, 471
Kutish, Francis A.
Needed Changes in State and Local Crop and Livestock Reports, 1050
Kutish, L. John
Rejoinder to Long's Reply on the Value Question, 144
Kuznets, George
Discussion: Surveys of Econometric Results in Agriculture, 235

Larson, Olaf F.
Sociological Aspects of the Low-Income Farm Problem, 1417
Lee, Ivan M.
See Reviews (Sanderson, Fred H.), 170
Limmer, Ezekiel
The Elasticity of Demand for Railroad Transportation of Florida Produce, 452
Lindberg, Ben A.
See Reviews (H. M. H. A. van der Valk), 751
Lindstrom, David E.
Japan Needs U.S. Surplus Food, 125
Long, Erven J.
See Reviews (Nelson, Lowry), 380
Loomis, Charles P.
Discussion: The Low-Income Farm Problem, 1438

Maier, Frank H.
Consumer Demand for Cigarettes Estimated from State Data, 690
Mauch, Arthur
Prospecting a Dry Hole, 360
McCorkle, Chester O., Jr.
Linear Programming as a Tool in Farm Management Analysis, 1222
McCormick, Francis B.
Livestock and Grain Market Reports—They Can Be Improved, 461
McNulty, James
Farm Tenancy and Costs of Borrowing, 358
Meissner, Frank
See Reviews (Krick, Irving P.), 173
Meyers, Trienah
Predicting Market Acceptance, 1387
Minot, Francis
See Reviews (White, Donald J.), 157
Mitchell, C. Clyde
The Proper Place of "Bigness" Argument in Agricultural Economics, 130
Moore, Clarence A.
Agricultural Development in Mexico, 72
Moore, H. R.
Discussion: The Low-Income Farm Problem, 1435
Morrison, T. C. and Judge, G. G.
Impact of Price Expectations and Uncertainties in Decision Making by Poultry Firms, 652

Nesius, E. J.
The Role of an Agricultural Economist in a Farm and Home Development Program—From an Administrator's Viewpoint, 840
Nicholls, William H.
Discussion: Conditions and Rates of Economic Growth, 834
Niehaus, Heinrich
Problems of Order of Economic and Agricultural Policy, 25
Nielson, James
Evaluating Extension Methods Used in Farm and Home Development: Reappraisal, 1302
Nybroten, Norman
Ogive Curves in a Demand Analysis, 560

O'Byrne, John C.
Discussion: Economic-Legal Approach to Agricultural Problems, 1157
Olson, Russell O.
Problems of Research in the Economics of Forage Production and Utilization, 1440
O'Regan, William G.
See Reviews (Working, Elmer J.), 752
Osgood, Robert E.
See Reviews (Marshall, Charles Burton), 383
Ottoson, Howard W.
The Application of Efficiency to Farm Tenure Arrangements, 1341
See Reviews (Murray, William G.), 153
Ottoson, H. W. and others
A Method of Farm Real Estate Valuation for Tax Assessment, 471
Owens, A. L. and Taylor, F. R.
Consumer Knowledge of Quality Determining Factors in Eggs, 625

Parsons, M. S.
Discussion: The Impact of Technological Changes on Milk Production, 1021

Paul, Allen B.
Discussion: Welfare Implication of Efficiency and Technological Improvements, 926
Penn, Raymond J. and Dorner, Peter
Discussion: Increasing Farmers' Understanding of Public Problems and Policies, 1324
Pesek, John and Heady, Earl O.
Hutton and Thorne on Isoclines: A Reply, 363
Peterson, Arthur W.
Evaluation of Extension Methods Employed in Farm and Home Development in the West, 1298
Peterson, G. A.
Discussion: Adjustments in a Growing Economy—Social Considerations, 1091
Selection of Maximum Profit Combinations of Livestock Enterprises and Crop Rotations, 546
Pine, Wilfred H.
Discussion: Organization and Administrative Arrangements for an Effective Water Policy, 901
Plath, C. V.
Factors and Fundamentals, 739
Plaxico, James S.
Discussion: Linear Programming as a Tool in Farm Management Analysis, 1258
Problems of Factor-Product Aggregations in Cobb-Douglas Value Productivity Analysis, 664
Putnam, P. L.
Evaluation of Extension Methods Employed in Farm and Home Development in the Northeast, 1286

Raeburn, John R.
See Reviews (Hammond, R. J.), 381
Ratchford, C. B.
Discussion: Economic Implications of Farm and Home Planning Work, 859
Redman, John C.
See Reviews (Wertz, V. R.), 579
Regan, Mark M. and Steel, Harry A.
Organization and Administrative Arrangements for an Effective Water Policy, 886
Reiss, Franklin J.
Discussion: Low-Income Problems in a High-Employment Economy, 1093
Rhodes, V. James
The Measurement of Consumer Preferences, 638
Robotka, Frank
See Reviews (Valko, Laszlo), 154
Rudd, Robert W.
Discussion: Methodological Problems in Agricultural Policy Research, 1327
See Reviews (Shepherd, Geoffrey S.), 749
Ruttan, Vernon W.
The Impact of Urban-Industrial Development on Agriculture in the Tennessee Valley and the Southeast, 38

Schaars, Marvin A.
Discussion: Local Data Wanted by Business Firms, 1057
Scott, Frank S. Jr.
Estimating Cattle on Feed, 127
Shepherd, Geoffrey S.
Discussion: Increasing Farmers' Understanding of Public Problems and Policies and Methodological Problems in Agricultural Policy Research, 1329
What Can a Research Man Do in Price Policy?, 305
Shoemaker, Karl
Discussion: The Place of Consumer Education in Increasing the Demand for Food, 1394
Sisk, Glenn N.
Rural Merchandising in the Alabama Black Belt, 705
Smith, Joel
Some Problems of Method in the Interstate Managerial Survey, 1105
Smith, Mervin G.
See Reviews (Bingham, Jonathan B.), 168
Smith, R. K.
Discussion: Making Existing Local Data More Available and Useful, 1053
Smith, Victor E.
Perfect vs. Discontinuous Input Markets: A Linear Programming Analysis, 538
Spencer, Leland
Discussion: Economic Problems Associated with Milk Marketing Orders, 1025
Staniforth, Sydney D. and Day, Lee M.
Organizing Economic Research Specifically for Use in a Farm and Home

Development Program, 848
Steel, Harry A. and Regan, Mark M.
Organization and Administrative Arrangements for an Effective Water Policy, 886
Stier, Howard L.
Industry Cooperation in Marketing Research—Potential Opportunities, 1219
Strand, Edwin G. and Heady, Earl O.
Efficiency within American Agriculture, 524
Suits, Daniel B.
An Econometric Model of the Watermelon Market, 237
Swanson, Earl R.
Integrating Crop and Livestock Activities in Farm Management Activity Analysis, 1249
Solving Minimum-Cost Feed Mix Problems, 135
Variability of Returns from the Hog Enterprise, 736

Taylor, F. R. and Owens, A. L.
Consumer Knowledge of Quality Determining Factors in Eggs, 625
Taylor, Henry C.
Richard T. Ely, 146
Thomas, D. Woods
Sociological Aspects of the Decision Making Process, 1115
Timmons, John F.
Integration of Law and Economics in Analyzing Agricultural Land Use Problems, 1126
Timoshenko, V. P.
See Reviews (Arkhimovich, Alexander), 760
Tintner, Gerhard
Discussion: Recent Econometric Studies in Agricultural Marketing, 279
Tintner, Gerhard and others
Programming with Consideration of Variations in Input Coefficients, 333
Tolley, George and Harrell, Cleon
Management of Meat Inventories, 252
Tontz, Robert L.
See Reviews (Long-Range Economic Projection, Studies in Income and Wealth, Vol. 16 ("Projections in Agriculture" by James P. Cavin and "Some Considerations in Appraising the Long-Run Prospects for Agriculture" by Rex F. Daly), 580
Toussaint, W. D.
Two Empirical Techniques Applicable to Land Tenure Research: Linear Programming and Single Equation Models, 1354
Trant, Gerald I.
Adjusting for Changes in Price Levels in Value Productivity Studies, 563

Vatter, Harold G.
Countervailing Power and Agricultural Policy, 555

Walsh, Robert M.
A Further Note on Methods of Increasing Domestic Consumption of Farm Products, 110
Discussion: The Place of Merchandising and Promotion in Expanding the Demand for Food, 1395
Ward, Edward H.
See Reviews (Kohls, Richard L.), 755
Waugh, Frederick V. and Cavin, James P.
Contributions of Agricultural Policies to General Economic Growth, 821
Wheeler, R. G.
The Impact of Technological Changes on Milk Production, 996
Wiley, J. W. and Kohls, R. L.
Aspects of Multiple-Owner Integration in the Broiler Industry, 81
Williams, M. S.
Evaluation of Extension Methods Employed in Farm and Home Development in the South, 1293
Witt, Lawrence
Some Additional Information, 116
Welfare Implications of Efficiency and Technological Improvements in Marketing Research and Extension, 912
See Reviews (Hardin, Charles M.), 757
Working, E. J.
How Much Progress has Been Made in the Study of the Demand for Farm Products?, 968
Working, Holbrook
See Reviews (Irwin, Harold S.), 377

Zaglits, Oscar
See Reviews (Papers and Proceedings of the Conference on Agricultural Taxation and Economic Development), 388
Zwick, Charles
See Reviews (Brunk, Max E.), 585

REVIEWS

af Heurlin, Lauri O., *The Economic Theory of Agricultural Production* (Hoos, Sidney), 759
Arkhimovich, Alexander, *Sugar Beets in the USSR: Selection and Seedbreeding* (Timoshenko, V. P.), 760

Beneke, Raymond R., *Managing the Farm Business* (Castle, Emery N.), 768
Bingham, Jonathan B., *Shirt-Sleeve Diplomacy—Point 4 in Action* (Smith, Mervin G.), 168
Brunk, Max E. and L. B. Darrah, *Marketing of Agricultural Products* (Zwick, Charles), 585

Coates, Glenn R., *Law and Practice in Chattel Secured Farm Credit* (Feder, Ernest), 177
Crawford, J. G., C. M. Donald, C. P. Dowsett and D. B. Williams; and A. A. Ross, *Wartime Agriculture in Australia and New Zealand, 1939-50* (Campbell, Keith O.), 164

Dewhurst, J. Frederic, *America's Needs and Resources: A New Survey* (Brandt, Karl), 746
Dunn, Edgar S. Jr., *The Location of Agricultural Production* (Judge, George G.), 577

Gray, Roger W., Vernon L. Sorenson and Willard W. Cochrane, *An Economic Analysis of the Impact of Government Programs on the Potato Industry of the United States* (Bishop, Charles E.), 161

Halcrow, Harold G. (ed.), *Contemporary Readings in Agricultural Economics* (Cochrane, Willard W.), 583
Hambidge, Gove, *The Story of FAO* (Eckstein, Alexander), 764
Hammond, R. J., *Food and Agriculture in Britain, 1939-1945; Aspects of Wartime Control* (Raeburn, John R.), 381
Hardin, Charles H., *Freedom in Agricultural Education* (Witt, Lawrence W.), 757

Irwin, Harold S., *Evolution of Future Trading* (Working, Holbrook), 377

Kaplan, A. D. H., *Big Enterprise in a Competitive System* (Knapp, Joseph G.), 158
Kohls, Richard L., *Marketing of Agricultural Products* (Ward, Edward H.), 755
Krick, Irving P. and Roscoe Fleming, *Sun, Sea and Sky* (Meissner, Frank), 73

Long-Range Economic Projection, Studies In Income and Wealth, Vol. 16 ("Projections in Agriculture" by James P. Cavin and "Some Considerations in Appraising the Long-Run Prospects for Agriculture" by Rex F. Daly), (Tontz, Robert L.), 580
Lösch, August (translated by William H. Woglom), *The Economics of Location* (Dunn, Edgar S., Jr.), 376

Marshall, Charles Burton, *The Limits of Foreign Policy* (Osgood, Robert E.), 383
Mighell, Ronald L., *American Agriculture: Its Structure and Place in The Economy* (James, H. Brooks), 767
Murray, William G., *Farm Appraisal, Classification and Valuation of Farm Land and Buildings* (Third Edition), (Ottoson, Howard W.), 153
Nelson, Lowry, *American Farm Life* (Long, Erven J.), 380
Papers and Proceedings of the Conference on Agricultural Taxation and Economic Development (Zaglits, Oscar), 388

Randall, C. B., *A Foreign Economic Policy for the United States* (Hillman, Jimmye S.), 385
Russell, E. John, *World Population and Food Supplies* (Kellogg, Charles E.), 574

Sanderson, Fred H., *Methods of Crop Forecasting* (Lee, Ivan M.), 170
Shepherd, Geoffrey S., *Marketing Farm Products* (Third Edition), (Rudd, Robert W.), 749
Smithies, Arthur, *The Budgetary Process in the United States* (Horton, Donald C.), 770
Spencer, Leland and S. Kent Christensen, *Milk Control Programs of the North-*

eastern States, Part I Fixing of Prices Paid and Charged by Dealers (Cook, Hugh L.), 762
Stone, Richard, assisted by D. A. Rowe and W. J. Corlett, Renee Hurstfield, Muriel Potter, *The Measurement of Consumers' Expenditure and Behaviour in the United Kingdom, 1920-1938*, Volume I (Halvorson, Harlow W.), 586

Tinley, J. M., *South African Food and Agriculture in World War II* (Hunt, K. E.), 175
Tostlebe, Alvin S., *The Growth of Physical Capital in Agriculture, 1870-1950* (Cochrane, Willard W.), 166

Valko, Laszlo, *International Handbook of Cooperative Legislation* (Robotka, Frank), 154
van der Valk, H. M. H. A., *The Economic Future of Canada* (Lindberg, Ben A.), 751

Wertz, V. R., *Economic Trends in Agriculture* (Redman, John C.), 579
White, Donald J., *The New England Fishing Industry* (Minot, Francis), 157
Working, Elmer J., *Demand for Meat* (O'Regan, William G.), 752

AWARDS FOR RESEARCH IN AGRICULTURAL ECONOMICS, 1955

To recognize and encourage meritorious research the American Farm Economics Association made seven awards in 1955; one of $100 for the best article appearing in the JOURNAL OF FARM ECONOMICS during 1954; three of $250 each for the best research reports published during 1954; and three of $250 each for the best theses submitted during 1954 in partial fulfillment of requirements for Doctor of Philosophy degrees. The recipients of these awards were:

Best Journal Article

Harold F. Breimyer	"Sources of our Increasing Food Supply"

Outstanding Ph.D. Theses

Roger Charles Woodworth	"Economic Analysis of Protein-Grain Substitution Relationships in Pork Production"
Norman Zellner	"An Economic Analysis of the California Prune In-Industry"
Louis M. Goreux	"Agricultural Productivity and Economic Development in France (1852-1950)"

Outstanding Published Research Reports

Rex F. Daly	"Some Considerations in Appraising the Long-Run Prospects for Agriculture"
George C. Judge	"Econometric Analysis of the Demand and Supply Relationships for Eggs"
Boris C. Swerling	"California Agriculture and International Commodity Developments"

THE AMERICAN FARM ECONOMIC ASSOCIATION

President
KARL BRANDT
Stanford University

President-Elect
H. BROOKS JAMES
North Carolina State College

Vice-Presidents
LAWRENCE W. WITT
Michigan State University

KARL A. FOX
Iowa State College

Secretary-Treasurer
LOWELL S. HARDIN
Purdue University

Editor
HAROLD G. HALCROW
University of Connecticut

Associate Editor
GEORGE K. BRINEGAR
University of Connecticut

Book Review Editor
ROBERT L. CLODIUS
University of Wisconsin

Editorial Council

JOHN BLACKMORE, Food and Agriculture Organization, Rome
JOHN M. BREWSTER, Marketing Research Division, Agricultural Marketing Service
KARL A. FOX, Iowa State College
J. K. GALBRAITH, Harvard University
CHARLES M. HARDIN, University of Chicago
CARL P. HEISIG, Production Economics Research Branch, Agricultural Research Service
SIDNEY HOOS, University of California
RICHARD A. KING, North Carolina State College
DAVID L. MACFARLANE, McGill University
JULIO O. MORALES, Inter-American Institute of Agricultural Sciences
L. J. NORTON, University of Illinois
WILFRED H. PINE, Kansas State College
J. R. RAEBURN, University of London

Editorial communications including manuscripts submitted for publication or inquiries concerning the *Journal* should be addressed to Harold G. Halcrow, Department of Agricultural Economics, University of Connecticut, Storrs, Connecticut. Communications concerning books for review and books, bulletins and other publications submitted for announcement in the *Journal*, should be addressed to Robert L. Clodius, Department of Agricultural Economics, University of Wisconsin, Madison 6, Wisconsin.

Applications for membership, changes in address, or inquiries regarding the general affairs of the Association should be addressed to Lowell S. Hardin, Agricultural Hall Annex, Purdue University, Lafayette, Indiana.

Nonmember subscription rates $5 annually.

GEORGE BANTA COMPANY, INC., MENASHA, WISCONSIN